NOTES

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THE MADDENI SERIES OF RHODODENDRON.

BY

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In the absence of a monograph of *Rhododendron*, the material for which is as yet far from adequate, it seems convenient to select, as Professor Bayley Balfour* has done, a fairly well-known species as the typical representative of a particular "series" or group, and to bring our knowledge of that group as much as possible up to date. The present contribution deals in such a manner with *Rhododendron Maddeni*, Hook. f., *R. Dalhousiae*, Hook. f., *R. ciliicalyx*, Franch., and the species closely allied to them; and this group for the sake of convenience may be called the "Maddeni series." This series, however, is no doubt a composite one, and contains three fairly well-marked but closely associated subordinate groups, each of which would more exactly correspond with Professor Bayley Balfour's conception of a "series." It includes practically all the larger-leaved Indian Rhododendrons with *lepidote* leaves, and their Chinese relatives.

This revision owes its conception entirely to the enthusiasm and encouragement of Professor Bayley Balfour, with whom the writer had lately the pleasure of comparing notes on a number of troublesome taxonomic questions regarding certain species of *Rhododendron*. The advantages of such to the writer of this paper will be obvious to all who know this large and difficult genus. Any special merits the present work may possess are due to the fact that the author has had for study the whole of the Edinburgh material of the series, including the beautifully preserved and fully annotated Yunnan collections of Mr George Forrest, with much other material gathered in Bhutan by Mr R. E. Cooper, and in Burma and Yunnan by Mr Kingdon Ward.

* Rhododendrons of the Irroratum Series, Trans. and Proc. Bot. Soc. Edin. xxvii. 157–220 (1917).

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For the opportunity of studying these specimens the writer tenders his grateful thanks to Professor Balfour, to the Kew Directorate for the necessary facilities in carrying out the work, and in particular to Dr Stapf, who has been ever ready to help with difficult questions.

The text figures are mainly of those species of which the material preserved up to the present is very scanty, often a single sheet. They do not claim any artistic merit, nor, having been prepared from dried material, can they give, of the flowers especially, a correct representation of perspective. But they will give some idea of the appearance of the dried plant (only one corolla is shown in each), particularly the shape of the leaves, the disposition of the leaf-scales and the appearance of the calyx, with the degree of scaliness of the style, etc., on which I have relied so much in framing the key.

DISTRIBUTION OF THE MADDENI SERIES.

The group has a fairly wide area of distribution, ranging from Sikkim (*R. Dalhousiae*, and others) in the west, east to Kweichow (*R. liliiflorum*), and southward to Tenasserim, in Lower Burma (*R. Veitchianum*). There are thirty-nine species in the series so far as known at present. The following list gives their names, distribution, and the name of the discoverer and year of collection; from it may be gathered some idea of the great number of species which have come to light during the last few years:—

SPECIES.	HABITAT.	COLLECTOR AND DATE.
R. brachysiphon, Balf. f.	Bhutan (6000–7000 ft.).	R. E. Cooper (1915).
R. burmanicum, Hutchinson	S.W. Burma (alt. ?).	Lady Wheeler Cuffe (1913).
R. calophyllum, Nutt.	Bhutan (6000–7000 ft.).	T. J. Booth (1850 ?)
R. carneum, Hutchinson	N.E. Burma (7500 ft.).	Major C. W. Browne (1912).
R. ciliatum, Hook. f.	Sikkim (9000–11,000 ft.).	J. D. Hooker (1849).
R. ciliicalyx, Franch.	W. Yunnan (7300 ft.).	Delavay (1883–5).
R. crassum, Franch.	W. Yunnan (7000–12,000 ft.) and N.E. Burma (8000–9000 ft.).	Delavay (1889).
**R. Cubittii*, Hutchinson	N. Burma (5500 ft.).	G. E. S. Cubitt (1909).
R. Cuffeanum, Craib	S.W. Burma (alt. ?).	Lady Wheeler Cuffe (1913).
R. Dalhousiae, Hook. f.	Sikkim (6000–8000 ft.).	J. D. Hooker (1848).
**R. dendricola*, Hutchinson	N.E. Burma (alt. ?).	Kingdon Ward (1914).
R. excellens, Hemsl. and Wils.	S.E. Yunnan (alt. ?).	A. Henry (1896–8).
R. formosum, Wall.	Khasia Hills, Assam (4000–5500 ft.).	R. Smith (1832).
**R. inaequale*, Hutchinson	Khasia Hills, Assam (4000–6000 ft.).	Griffith (1835).
**R. iteaphyllum*, Hutchinson	Khasia Hills, Assam (2000 ft.).	J. D. Hooker (1850).

* Described for the first time in the present paper.

SPECIES.	HABITAT.	COLLECTOR AND DATE.
**R. Johnstoneanum*, Watt .	Manipur, Assam (6000–7500 ft.).	G. Watt (1882).
**R. lasiopodum*, Hutchinson .	W. Yunnan (8000–9000 ft.).	G. Forrest (1913).
R. liliiflorum, Léveillé .	Kweichow (alt. ?).	J. Cavalerie (1902).
R. Lindleyi, T. Moore .	Sikkim, Bhutan, and Manipur (6000–10,000 ft.).	J. D. Hooker ? (1848).
R. Ludwigianum, Hosseus .	Siam (6600 ft.).	C. C. Hosseus (1905).
R. Lyi, Léveillé . .	Kweichow (alt. ?).	J. Cavalerie (1912).
R. Maddeni, Hook. f. . .	Sikkim and Bhutan (5000–9000 ft.).	J. D. Hooker (1848).
R. manipurense, Balf. f. et Watt	Manipur, Assam (8000–10,000 ft.).	G. Watt (1882).
R. megacalyx, Balf. f. et Ward	N.E. Burma (7000–8000 ft.).	Kingdon Ward (1914).
R. missionarum, Léveillé .	W. Yunnan (9000 ft.).	E. E. Maire (1911).
R. Nuttallii, Booth . .	Bhutan (4000–5000 ft.).	T. J. Booth (1850 ?).
R. pachypodum, Balf. f. et W. W. Sm.	W. Yunnan (9000–10,000 ft.).	G. Forrest (1913).
**R. pilicalyx*, Hutchinson .	S.E. Yunnan (8000 ft.).	A. Henry (1896–8).
**R. polyandrum*, Hutchinson	Bhutan (8500 ft.).	R. E. Cooper (1914).
**R. pseudociliicalyx*, Hutchinson	Szechuan ?	Coll. ?
R. rhabdotum, Balf. f. et. Coop.	Bhutan (8000 ft.).	R. E. Cooper (1915).
**R. roseatum*, Hutchinson .	W. Yunnan (9000 ft.).	G. Forrest (1913).
**R. rufosquamosum*, Hutchinson	S. Yunnan (4800 ft.).	A. Henry (1896–8).
**R. Scottianum*, Hutchinson	W. Yunnan (6000–8000 ft.).	G. Forrest (1912).
**R. Smilesii*, Hutchinson .	Siam (alt. ?).	F. H. Smiles (1893).
**R. supranubium*, Hutchinson	W. Yunnan (10,000–12,000 ft.).	G. Forrest (1906).
R. Surasianum, Balf. f. et Craib	N. Siam (4500 ft.).	A. F. G. Kerr (1914).
**R. Valentinianum*, G. Forrest	W. Yunnan (11,000 ft.).	G. Forrest (1917).
R. Veitchianum, Hook. f. .	Central and Lower Burma and Siam (5000–7000 ft.).	T. Lobb (1856).

GROUPING OF THE SPECIES.

The thirty-nine species fall into three fairly natural groups as follows :—

Subseries I.—**Eumaddenia,** with numerous (15–25) stamens, numerous (10–12) ovary cells, a fairly large calyx, medium-sized leaves very densely covered with ferruginous scales, and with the petiole grooved on the upper surface. According to the prevailing views on the phylogeny of *Gamopetalae* in general this should, I think, be regarded as the more ancient group of this particular series. Its headquarters seems to be in Bhutan, where there are four species represented, and there is one species in Sikkim, one in Manipur, and one common to North-East Burma and Western Yunnan.

* **Described for the first time in the present paper.**

Subseries II. — **Megacalyx,** with usually 10 stamens, always 5 ovary cells, a large calyx, and large leaves rather laxly lepidote, with a raised midrib on the upper surface, and convex petioles; the *convex* upper surface of the petiole is a splendid mark for distinguishing this group. Here again Bhutan is the chief centre of distribution, as it harbours four species, two of which extend into Sikkim, whilst Burma, Yunnan, and Kweichow have each a separate species. To this group belong the finest species of the whole series, with very large scented flowers and handsome foliage.

Subseries III.—**Ciliicalyx** is the largest group, made up of twenty-six species, which are the most troublesome to define. They are probably the more modern representatives of the series as a whole. The stamens are nearly always 10 in number (rarely 12–13), the ovary cells very frequently 6 (rarely 5 or 7), a calyx (often ciliate) which becomes gradually reduced to a mere undulate rim, rather small leaves more or less densely lepidote below and frequently ciliate, with a V-shaped groove on the upper surface of the petiole. There is only one species of this subseries in Sikkim, none in Bhutan, three species in the Khasia Hills, one in Manipur, six in Burma, three in Siam, and one species common to these two countries, ten in Yunnan, and one in Kweichow. Subseries *Ciliicalyx* is thus typical of Burma and Yunnan.

DISTRIBUTION OF INDIVIDUAL SPECIES.

As careful work in the discrimination of *Rhododendron* species proceeds, it becomes increasingly evident that the majority are very local in distribution. Only two species of our series are common to Sikkim and Bhutan (*R. Maddeni* and *R. Lindleyi*), the latter species also occurring in Manipur, Assam, and there is one species (*R. Veitchianum*) common to Burma and Siam, whilst *R. crassum* occurs in Western Yunnan and N.E. Burma. With these exceptions no species is common to any two of the countries mentioned above. The occurrence of *R. Lindleyi* in Sikkim, Bhutan, and in Manipur affords an interesting link between the Rhododendron floras of these mountainous regions. The more or less isolated mountain ranges of Burma, too, seem to possess their own particular species. Of special interest in this respect is Mount Victoria (10,150 ft.) in the Chin Hills, Western Middle Burma, where Lady Wheeler Cuffe has, within the last few years, collected and introduced into cultivation two interesting new species in *R. burmanicum* and *R. Cuffeanum.*

In regard to Yunnan, Professor Balfour (l.c.) has already demonstrated in his paper on the *Irroratum* series the extremely

limited and local distribution of several species. This fact is confirmed in the case of *R. ciliicalyx* and its relatives, many of which are described for the first time in the present paper. In this case a difference in altitude seems to produce a difference in species, all of which, however, belong to the same complex. *R. ciliicalyx* itself occurs at an altitude of 7300 ft. near Mo-so-yn, whilst *R. Scottianum* grows at a similar elevation near Tengyueh and Chutong. At 8000–9000 ft. on the Shweli-Salween Divide we get *R. roseatum* and *R. lasiopodum*, whilst on the eastern flank of the Tali Range, between 10,000 and 12,000 ft., there is a beautiful little species, which from its occurrence at such a high altitude I have called *R. supranubium*. No doubt Mr Forrest could enlighten us much more regarding the distribution of these species now that they have been segregated from *R. ciliicalyx*, to which they had been provisionally referred. True *R. ciliicalyx* has not appeared in any recent collections. Then even Szemao in South and Mengtz in South-Eastern Yunnan has each its characteristic species, belonging to the same group, in *R. rufosquamatum* and *R. pilicalyx* respectively, whilst a near relative, *R. Lyi*, occurs in the neighbouring province of Kweichow. Just how constant are the differences which go to distinguish these Yunnan species as shown in the key (p. 16), and to what extent they will stand the test of cultivation and further collection, I am not prepared to say.

VALUE OF CHARACTERS IN THE MADDENI SERIES.

Habit.—Some of the species are epiphytic on old tree stumps; such are *R. Nuttallii*, *R. Lindleyi*, and *R. Veitchianum*, whilst *R. dendricola* grows at the tops of trees 50–60 ft. high; the majority, however, are terrestrial shrubs or small trees, ranging in height from 1½ to 20 ft.

Bark.—In only a few species is the bark of the stem and older branches known to the writer; in *R. ciliicalyx* it is very membranous and purplish-brown, and curls off in large pieces; a similar but thicker bark is found in *R. Veitchianum*.

One-year-old Shoots.—All are more or less lepidote, whilst in subseries *Ciliicalyx* they are very frequently bristly hairy as well as lepidote, as in *R. ciliatum*, *R. Johnstoneanum*, and *R. Lyi* (fig. 7).

Axillary Leaf-bearing Buds.—The dormancy or degree of development of the axillary leaf-bearing buds at the time of flowering seems worthy of attention, although the character might vary in different individuals of the same species. In *R. ciliicalyx* and *R. Scottianum* the leaf-buds are well developed at the time of flowering.

Terminal Leaf-bearing Buds.—In regard to the structure of

the *terminal* leaf-bearing buds Professor Balfour makes some interesting remarks at the end of the description of *R. Valentinianum* on p. 49.

Leaves.—These are always evergreen, and more or less coriaceous in texture; they persist for at least three years; in shape they vary from linear (*R. iteaphyllum*) to obovate (*R. Dalhousiae* and *R. Scottianum*), and ovate (*R. roseatum*), rounded, obtuse to acutely cuneate at the base; frequently, especially in subseries *Ciliicalyx*, they are fringed with long hairs (*R. ciliatum*, *R. formosum*, and others); the upper surface on the unfolding of the leaves is almost without exception lepidote, the scales soon falling off; a characteristic feature of *R. burmanicum* is that they persist on the upper surface and are nearly as dense there as on the lower surface; the lower leaf surface is always lepidote, and the disposition of the scales provides a useful and apparently very constant specific mark; for instance, in *R. Maddeni* they completely hide the lower epidermis, whilst in *R. Lindleyi* and *R. ciliicalyx* they are considerably more than their own diameter apart; the distance apart relative to their own diameter seems to be the most lucid way of expressing the disposition of the scales; were it measured in terms of millimeters or fractions thereof, the distinctive marks as shown by the scales would not be so readily interpreted; the structure of the scales is on the same general plan throughout the series; the stalk of the scale is more or less fleshy, and a little immersed below the level of the surrounding leaf surface; the stalk supports the membranous fringe, which encircles it and spreads horizontally over and in close proximity to the leaf surface; the fringe of the scale is made up of numerous radiating parallel cells arranged in a single row; I have not considered it worth while to count the number of these fringe cells, but they might prove to be relatively constant in the same species, and would perhaps differ sufficiently in the various species as to provide additional distinctive characters; between the scales the epidermal cells are always produced into a rod-like or bluntly awl-shaped papilla; these are a very marked feature * in the leaves of the whole series, and readily detected by a low power of the microscope; they are not visible through an ordinary hand lens; the midrib in subseries *Eumaddenia* and *Ciliicalyx* is always more or less sunken below the upper surface of the leaf blade, whilst in subseries *Megacalyx* it is raised; this impression and elevation of the midrib is accompanied by a marked difference in the *petiole*; those leaves with an impressed midrib have always petioles with a concave upper surface and

* In *R. ciliicalyx* they tend to disappear in cultivation under certain conditions; see p. 53.

a V-shaped groove down the middle, whereas those with the elevated midrib have a convex upper surface and no groove, with one slight exception (*R. megacalyx*).

Inflorescence.—This is a terminal loose umbellate truss, and from 1-flowered (*R. pachypodum, R. supranubium*) to 12-flowered (*R. Nuttallii*); the flower-bearing bud is usually broadly ovoid, and covered with numerous *bud-scales* leathery in texture, usually bluntly mucronate, and variously lepidote and glabrous or pubescent outside; in *R. Nuttallii* the flower-bearing bud just before opening is about 6 inches long (Hook., Bot. Mag., t. 5146); the length of the axis from which the bud-scales have fallen, and the approximation of the straw-coloured scars, vary considerably in separate species; the bracts and bracteoles subtending the individual pedicels have frequently fallen away at flowering time, and are so often absent from dried specimens that I have seen few to describe; as a rule they furnish little of specific importance; the pedicels are lepidote, except in *R. megacalyx*, and they are both pubescent and lepidote in *R. Dalhousiae* and *R. rhabdotum*; they nearly always arise from approximately the same height (subumbellate); in *R. lasiopodum* they break off and leave a projecting "foot" like tomentose portion of the axis of the inflorescence.

Calyx.—This varies from a mere undulate rim (*R. lasiopodum*) to very large (2.3 cm.), especially in subseries *Megacalyx* and in subseries *Eumaddenia*; frequently the lobes (or the rim) are longer on the dorsal (adaxial) side; in subseries *Ciliicalyx* the lobes (or the rim) are very frequently bristly ciliate, but the degree of ciliation is evidently subject to considerable variation, and is sometimes present and absent even in the same inflorescence (*R. supranubium*); in the other two groups the calyx is usually not ciliate, or if it is, then very softly and weakly so (*R. Lindleyi*); *R. megacalyx* (see fig. 4) is remarkable in having the calyx campanulate and lobed only to about the middle; in nearly all the species the calyx is lepidote outside, especially towards the base.

Corolla.—In shape more or less tubular or funnel-like, and always 5-lobed; the presence or absence of scales on the outside of the tube furnishes a good specific character, and I have freely employed this feature in framing the key; the lobes are always lepidote down the middle and occasionally on the margin; the corolla of *R. Ludwigianum*, in addition to being lepidote outside, is very softly and densely villous, whilst several more species of the *Ciliicalyx* group are minutely and softly pubescent outside the base of the corolla tube; the colour of the corolla is white or white and flushed with rose, and a few (*R. lasiopodum*, and others) have a yellow blotch inside the base of the tube;

there is no red or purple spotting, such as one gets in *R. yunnanense*, for example. *R. burmanicum* has a greenish-yellow and *R. pachypodum* a yellow corolla.

Stamens.—These are numerous (15–25) in the *Eumaddenia* group, and usually 10 in the other two groups; they are, almost without exception, considerably longer than the corolla tube and rather unequal in length, corresponding to the slight zygomorphy of the corolla; the filaments, except in *R. Maddeni* and *R. calophyllum*, are pubescent in their lower part; the anthers are very large (8–13 mm.) in group *Megacalyx*, whilst in the other two groups they are much smaller, averaging about 5–6 mm. in *Ciliicalyx*.

Ovary.—The number of ovary cells is usually consistent in each species. In the *Eumaddenia* group there are from 10 to 12 cells, and the ovary passes gradually into the style; in group *Megacalyx* the number is constantly 5, whilst in *Ciliicalyx* it is more often 6, and the transition to the style is usually very abrupt; in all the species the ovary is densely lepidote, and girt at the base by a more or less shortly tomentose annular disk.

Style.—Except in *R. ciliatum*, where it is glabrous, the style is more or less lepidote; in *R. ciliicalyx* it is only so for a few millimeters above the base, and in this species there are a few hairs as well; I find the degree of scaliness of the style to be very constant in each species.

Stigma.—The exact form of the stigma is not readily made out from dried specimens; in most species it appears to be depressed and lobulate, and more or less viscid.

Capsule.—This is very oblique in *R. inaequale*, less so in a few other species, but straight in the majority; the number of valves always corresponds with the number of ovary cells; the capsule is constantly more or less lepidote, and the central axis, from the top of which the valves dehisce, is often tipped by the persistent style.

Seeds.—Always small, brown or straw-coloured, mostly acute at both ends, and narrowly winged.

Professor Balfour had already studied the indumentum of the *Maddeni* series when I took up this revision, and he very kindly allows me to insert the following notes of his own:—

"These Rhododendrons have all of them lepidote leaves. Some of them have in addition in the young state a varying number of setose hairs which may disappear before the leaf reaches full size. The peltate scales occur upon both surfaces of the young leaf. They are sunk in pits of the leaf surface, these varying in depth, each scale showing a stout pluricellular stalk and a disk with typical umbo and fringe equalling the radius of the umbo. The outermost cells of the umbo at an

early period develop a yellowish subsequently red content which ultimately spreads over the whole umbo. Hence the change of colour in some species of the under leaf surface to a ferruginous tint. The pits on the upper leaf surface hardly deserve the name. From this surface the scales fall off early as a rule and the mature leaf shows scarcely an undulation to indicate the points of fall. At the same time a few remanent scales may always be found and in some cases these may be numerous. In *Rh. Maddeni*, Hk. f., for instance in cultivation the surface is often bronzed by them and the same may be seen often in *Rh. crassum*, Franch. On the under surface the pits are deeper and can always be seen even on the oldest leaves from which the scales have fallen. In some where the leaf pit is shallow and the stalk long enough to raise the umbo out of it the fringe is depressed; in others the umbo is beneath the level of the mouth of the pit and then the fringe becomes slightly concave upwards—in the case of a species like *Rh. megacalyx*, Balf. f. et Ward, where the pit is deep and the whole scale barely reaches its mouth the fringe is turned directly upwards. The scales vary in size and there seems a general tendency for some of them to form longer stalks and broader disks and to stand out well above the surface of the leaf on the under side especially on the larger veins.

"The distribution of the scales on the under side gives us a readily observed mark by which to diagnose species and it is particularly valuable for the separation of *Rh. formosum*, Wall. from other forms which have been confused with it. And here let me say that the distribution of the scales is correlated with other leaf characters which shows that their relative position is not fortuitous. In none of the species as yet known to me do the scales on the under surface of the mature leaf overlap, in none do neighbouring ones touch each other everywhere. A portion of the leaf epidermis is always visible between the scales. Most of the species have the scales approximating so that one may say there is visible as much if not more scale surface than epidermal surface. We may for convenience speak of this as a *densely lepidote surface*. A smaller number of forms—amongst them *Rh. formosum*, Wall., *Rh. Veitchianum*, Hook., *Rh. Dalhousiae*, Hk. f.—have the scales relatively far apart and the visible epidermal surface is far larger in area than the scale surface. This I designate a *laxly lepidote surface*.

"The leaf surface between the scales is always grey or white grey, the latter specially in the laxly lepidote forms. This bloom can be rubbed off and if one handles fresh specimens the fingers become greasy. The colour is due to the epidermal papillae with their granular coating of wax making a surface

unwettable to water from the outside and restraining the exit of water from within the leaf. In species of the laxly lepidote series where the exposed leaf surface is largest—*Rh. Veitchianum*, Hook., *Rh. formosum*, Wall., *Rh. Dalhousiae*, Hk. f. for example —the epidermal papillae are long rod-like outgrowths with parallel sides standing out at right angles from the epidermis and more or less closely packed. In no one of the densely lepidote series are those papillae long rod-like and close-set but more or less conoid or in the form of low domes having wider spaces between than in the case of rods with parallel sides. Sometimes where a scale fringe arches over the leaf surface the papillae are longer than elsewhere. There is clearly a correlation between the form of papillae with their wax and the covering of peltate scales. That the southern types *Rh. Veitchianum*, Hook., and *Rh. formosum*, Wall., are conspicuously laxly lepidote with grey white bloom may be noteworthy in relation to their habitat."

Certain species need special mention. These are *R. Dalhousiae*, Hk. f., *R. formosum*, Wall., and *R. inaequale*, Hutchinson.

R. Dalhousiae, Hook. f.

In the examination of the dried material of *Rhododendron Dalhousiae* I have detected a very fine species of Rhododendron which appears to have been overlooked by Sir Joseph Hooker. *R. Dalhousiae* was described by Hooker in his account of the Sikkim Rhododendrons, p. 2, t. i and ii (1849). The first plate of that work is a picture of the plant as it grows epiphytically on trees in Sikkim (see extracts from Hooker's Journal below). The second plate was drawn by Fitch from Hooker's original sketch, *and evidently also from the dried specimens*. Emphasis is laid on the latter fact, because it seems partly responsible for the confusion of two species. Amongst Sir Joseph's exsiccatae is one sheet marked " Rhod. xiv. J. D. Hooker, Sikkim Himalaya 1848, 6–8000 ft." It is a fine leafy flowering branchlet, and in the corner is a solitary fruit which certainly does not belong to it. This specimen differs from typical *R. Dalhousiae* (as represented by Hooker's *original sketch* and by the remainder of his dried specimens) in having only scaly pedicels (not hairy as well), broad membranous striate calyx lobes *with a dense fringe of soft hairs on the margin* (in true *Dalhousiae* they are narrower and not fringed), a corolla with a tube only 5 cm. long (much smaller than in typical *Dalhousiae*), which is sparingly scaly outside the base; the leaves also differ from typical *Dalhousiae* in that they are elliptic and more or less *rounded*

at the base, and the scales are more laxly disposed on the lower surfaces. Comparing with *Dalhousiae*, this distinct species may therefore be at once recognised by its *fringed calyx* and *smaller flowers* (see fig. 6).

Now it is quite clear on consideration of the evidence before us that Fitch's plate No. ii. is made up from a confusion of two species. Hooker's original sketch of what he no doubt regarded as the real *Dalhousiae* shows the large flowered species with the glabrous calyx and the smaller obovate cuneate-based leaves, typical of the species as known in our gardens. But unfortunately for the accuracy of his beautiful plate, Fitch must also have had recourse to the dried specimens: he draws faithfully the large corolla of the real *Dalhousiae*, but has appended to it the large ciliate calyx of the other species, which I identify with the hitherto imperfectly known *R. Lindleyi*, T. Moore (*R. bhotanicum*, Clarke). The leaves, shown in the plate, are I think rather those of *R. Lindleyi* than of *Dalhousiae*; they are larger than any on Hooker's sketch, and the glands are shown more laxly dispersed.

In Hooker's description accompanying the plate there is no mention of the hairs on the margin of the sepals, though they are shown clearly enough. But Hooker, himself, evidently brought the specimens of *R. Lindleyi* into his later descriptions, for in the Royal Horticultural Society's Journal for 1852, p. 77, he describes *R. Dalhousiae* as having "sepals oblong, blunt, hairy on the margin," whereas in the specimens of his typical *Dalhousiae* they are quite glabrous.

Hooker (Himal. Journ. i. 125) mentions *Rhododendron Dalhousiae* in his account of the ascent of Sinchul near Darjeeling. He describes the vegetation as follows: "The purple-flowered kind of Magnolia (*M. Campbellii*) hardly occurs below 8000 feet, and forms an immense but very ugly black-barked sparingly branched tree, leafless in winter and also during the flowering season, when it puts forth from the ends of its branches great rose-purple cup-shaped flowers, whose fleshy petals strew the ground. On its branches, and on those of oaks and laurels, *Rhododendron Dalhousiae* grows epiphytically, a slender shrub, bearing from three to six white lemon-scented bells, four and a half inches long and as many broad, at the end of each branch. In the same woods the scarlet rhododendron (*R. arboreum*) is very scarce, and is outvied by the great *R. argenteum*, which grows as a tree forty feet high, with magnificent leaves twelve to fifteen inches long, deep green, wrinkled above and silvery below, while the flowers are as large as those of *R. Dalhousiae* and grow more in a cluster."

Again in his account of Tonglo Mountain near Darjeeling

in May 1848 he says: "Above Simonbong, the path up Tonglo is little frequented: it is one of the many routes between Nepal and Sikkim, which cross the Singalelah spur of Kinchinjunga at various elevations between 7000 and 15,000 feet. As usual the track runs along ridges, wherever these are to be found, very steep, and narrow at the top, through deep humid forests of oaks and Magnolias, many laurels, both *Tetranthera* and *Cinnamomum*, one species of the latter ascending to 8500 feet, and one of *Tetranthera* to 9000 feet. Chestnut and walnut here appeared, with some leguminous trees, which however did not ascend to 6000 feet. Scarlet flowers of *Vaccinium serpens*, an epiphytic species, were strewed about, and the great blossoms of *Rhododendron Dalhousiae* and of a Magnolia (*Talauma Hodgsoni*) lay together on the ground."

In his herbarium there is an envelope containing a single leaf and a corolla which are unmistakably *R. Dalhousiae*; and the envelope is marked "Rhod. Dalhousiae, Tonglo, Sikkim. May 1848." This corolla is no doubt one of those which he mentions as lying on the ground with those of the *Talauma*.

Hooker only refers to *Rhododendron Dalhousiae* on two other occasions. In describing his ascent of Choongtam Mountain (10,000 ft.) in May 1849 (Journal, ii. p. 25) he mentions its occurrence: "On the hill above Choongtam village I gathered, at 5000 to 6000 feet, *Rhododendron arboreum* and *Dalhousiae*, which do not generally grow at Darjeeling below 7500 feet. I collected here ten kinds of Rhododendron, which, however, are not the social plants that they become at greater elevations. Still, in the delicacy and beauty of their flowers, four of them, perhaps excel any others; they are, *R. Aucklandii*, whose flowers are five inches and a half in diameter; *R. Maddeni*, *R. Dalhousiae*, and *R. Edgeworthii*, all white-flowered bushes, of which the two first rise to the height of small trees."

Whether in this case Hooker was speaking of true *R. Dalhousiae* or *R. Lindleyi* I cannot say, as there seems to be no specimen amongst his exsiccatae from Choongtam. However, in the Journal, p. 185, we learn that Hooker and his party in October "arrived at Choongtam (for the fourth time). . . . I spent a day here in order to collect seeds of the superb rhododendrons which I had discovered in May, growing on the hills behind." In a footnote to p. 186 he says: "These Rhododendrons are now all flourishing at Kew and elsewhere; they are *R. Dalhousiae, arboreum, Maddeni, Edgeworthii, Aucklandii* and *virgatum*."

On Hooker's journey to the Chola Pass in November 1849 (p. 197) he says: "A long march up a very steep, narrow ridge took

us by a good road to Langhep, a stone resting-house (10,475 ft.) on a very narrow flat. I had abundance of occupation in gathering rhododendron seeds, of which I procured twenty-four kinds on this and the following day. These occurred in the following order in ascending, commencing at 6000 feet.—1, *R. Dalhousiae*; 2, *R. vaccinioides*; 3, *R. camelliaeflorum*; 4, *R. arboreum*. Above 8000 feet.—5, *R. argenteum*; 6, *R. Falconeri*; 7, *R. barbatum*; 8, *R. Campbelliae*; 9, *R. Edgeworthii*; 10, *R. niveum*; 11, *R. Thomsoni*; 12, *R. cinnabarinum*; 13, *R. glaucum*. Above 10,500 feet.—14, *R. lanatum*; 15, *R. virgatum*; 16, *R. campylocarpum*; 17, *R. ciliatum*; 18, *R. Hodgsoni*; 19, *R. campanulatum*. Above 12,000 feet.—20, *R. lepidotum*; 21, *R. fulgens*; 22, *R. Wightianum*; 23, *R. anthopogon*; 24, *R. setosum*.

We may assume that all the earlier cultivated plants of *R. Dalhousiae* in this country were grown from seeds collected by Hooker on the Choongtam Mountain at 5000-6000 ft., and on his ascent to the Chola Pass between 6000 and 8000 ft.

Regarding the epiphytic habit of some species, Hooker says (Journ. Hort. Soc. Lond. vii. 72 (1852): "Much undue importance has been given to the fact of some kinds growing habitually epiphytically (*R. Dalhousiae*, *R. camelliaeflorum*, *R. pendulum*), and it has been supposed that much difficulty must attend their cultivation. Having occasionally seen all these species growing on rocks, and the two latter sometimes becoming erect, and that always in exposed but very moist localities, I have been induced to attribute their predilection for the branches of trees to their weak habit and want of light elsewhere. Being plants of the forest region, and unable to contend against the vigorous undergrowth that prevails there, the offspring of such seeds as fall to the ground are choked, whilst the perennially humid atmosphere supports such as sprout on the mossy limbs of trees, where they receive the stimulus of light. *R. Dalhousiae*, for instance, which is never found on the ground in the woods of Darjiling, grows in thousands on the clay and mould banks of the roads which are cut through the forest, the young plants coming up in profusion as soon as the cuttings are made: these, however, seldom attain any size, from the too great exposure of the soil, which in the dry season rapidly parches during a short day's heat. In Dr Campbell's garden at Darjiling there is a perpendicular bank, 15 feet high, exposed to the west, and partly sheltered from the south-west by a house. *R. Dalhousiae* has annually appeared on this, the seeds being imported by winds or birds from the neighbouring forest. The seedlings, however, perished till within the last two years, since which time abundance of *Lyco-*

podium clavatum and a *Selaginella*, with *Marchantia*, retain so constant a supply of moisture that the plants now flourish and flower in perfection."

R. formosum, Wall.

Rhododendron formosum was first described by Wallich in 1832 (Plantae Asiaticae Rariores, vol. iii. p. 3, t. 207) from specimens communicated to him by a Mr Smith in the year 1815. Wallich says the specimen came from "the mountains bordering on the province of Sylhet by the late Mr Smith." On the back of the original Wallichian drawing in the Kew collection, marked as having been painted by "Royle, Carey & others," there is a pencil note saying the plant figured was from the Khasia Hills. In the first volume of Wallich's publication we learn from the preface that Mr R. Smith was "an inhabitant of Sylhet," and no doubt his excursions carried him into the Khasia Hills to the North-West. I have not found a specimen of *R. formosum* in Wallich's herbarium at Kew. But a Griffithian specimen (Kew Distrib. No. 3506 partly) corresponds very closely indeed to the drawing, and might be regarded as a suitable *topotype*. This was collected by Griffith on the 9th November, 1835 near a torrent on the road between Moflong and Myrung, Khasia Hills. It is very nearly devoid of the long slender hairs on the petioles and leaf margins which are often so characteristic a feature of *R. formosum* in cultivation. But there are a few on the petioles of Griffith's specimen and some on the margin of the very young leaves. Wallich's description makes no mention of these cilia, nor does he show them in his excellent figure. But he no doubt described an entirely epilose mature condition, which is represented by another of Griffith's specimens not localised or dated but bearing the same Kew distribution number (3506). I am convinced that the entire absence of cilia from the petiole and leaf margins is not to be relied on as a mark of specific distinction in this particular instance. Neither is Wallich's description of the ovary as *villous* of much importance; he very probably saw the ovary through the densely pubescent filaments and thought it was villous, when in reality it is only densely lepidote. In the picture there is no indication of its being hairy. Yet another discrepancy is the fact that he described the style as glabrous, whereas it is rather minutely lepidote in the lower part. The importance of close observance of these fundamental specific characters was no doubt in those early days not realised.

The plant described and figured as *R. Gibsoni* by Paxton in his Magazine of Botany, viii. p. 217, is in my opinion not

specifically different from *R. formosum*. It was found on the summit of the Khasia Hills at an elevation of about 4000 ft. by Mr J. Gibson, by whom it was introduced in 1837 into the gardens of His Grace the Duke of Devonshire at Chatsworth. The herbarium specimens at Kew show almost every gradation in the ciliation of the mature leaves, from entirely glabrous to long-ciliate; the young leaves are almost invariably densely ciliate. The degree of ciliation is no doubt regulated by the age and vigour of individual plants, the older plants, like *R. yunnanense*, tending to lose their hairs altogether.

The status of the varieties *salicifolia* and *inaequalis* of C. B. Clarke in the Flora of British India deserves closer study than has perhaps hitherto been accorded them. They seem to me to be worthy of specific rank, and I am confident they would appear so if all were in cultivation. I have only seen *R. formosum* in gardens, where it is still usually grown under the name *R. Gibsoni*. Some future collector in the Khasia Hills will be able to throw much further light on this question. The dried material of the three forms in this country is scarcely sufficient to give a final opinion, but it is enough to show that these plants should by no means be "lumped" together under one name. There is very great variation in *R. formosum* as shown by cultivated plants in the Temperate House, Kew, but I do not think it possible to segregate them into distinct varieties or even forms.

Rhododendron inaequale, Hutchinson.

(*R. formosum*, var. *inaequalis*, C. B. Clarke.)

Excepting Mr C. B. Clarke's record from Shillong, Khasia Hills, this species would appear to have been gathered only on the Kollong Rock, a remarkable hill visited by Hooker in July 1850, and described (Himal. Journ. ii. p. 293 with drawing) as follows:—"We twice visited a very remarkable hill, called Kollong, which rises as a dome of granite 5400 feet high, ten or twelve miles south-west of Myrung, and conspicuous from all directions. . . . All the streams rise in flat marshy depressions amongst the hills with which the whole country is covered; and both these features, together with the flat clay marshes into which the rivers expand, are very suggestive of tidal action. Rock is hardly anywhere seen, except in the immediate vicinity of Kollong, where are many scattered boulders of fine-grained gneiss, of which are made the broad stone slabs, placed as seats, and the other erections of this singular people. We repeatedly remarked cones of earth, clay, and pebbles, about twelve feet high, upon the hills, which

appeared to be artificial, but of which the natives could give no explanation. Wild apple and birch are common trees, but there is little jungle, except in the hollows, and on the north slopes of the higher hills. Coarse long grass, with bushes of Labiate and Composite plants, are the prevalent features.

"Kollong rock is a steep dome of red granite, accessible from the north and east, but almost perpendicular to the southward, where the slope is 80° for 600 feet. The elevation is 400 feet from the mean level of the surrounding ridges, and 700 above the bottom of the valleys. The south or steepest side is encumbered with enormous detached blocks, while the north is clothed with a dense forest, containing red tree rhododendrons and oaks; on its skirts grew a white bushy rhododendron, *which we found nowhere else.*"

This white bushy rhododendron must have been *R. inaequale*, though there are no flowers on Hooker's specimens. The red one collected by Hooker was no doubt what is at present regarded as *R. arboreum*, but it too is in fruit. One wonders why, if they were in flower, Hooker did not collect flowering material; or did he guess the colour of the flowers? Hooker collected only these two Rhododendrons on the Kollong Rock, a locality which would no doubt repay the attention of some future collector.

Mr Clarke made the following remark regarding his var. *inaequalis* (Fl. Brit. Ind., iii. p. 473):—"This has been considered a distinct species, and may be so, but the flowers are unknown. Branches often hirsute-setose; leaves entirely without the setose ciliae common (but sometimes wanting) in *R. formosum.* Capsules (of which there are numerous examples) more unsymmetric than in any other Indian Rhododendron." These remarks are very much to the point. In his own herbarium there are flowers, though much past their best and rather withered, which were collected after the publication of the Flora of British India.

KEY TO THE SPECIES OF THE MADDENI SERIES.

I. **Eumaddenia.**—*Petiole with a V-shaped groove on the upper side; leaves medium-sized, very densely rufous-lepidote, with the midrib impressed on the upper surface; stamens* 15–25 (see also R. excellens), *the filaments either glabrous or pubescent; ovary cells* 10–12; *calyx usually well developed.*

Filaments of the stamens glabrous:

Scales on the lower surface of the leaves contiguous or nearly so, never more than their own diameter apart . . 1. *Maddeni.*

Scales on the lower surface of the leaves from 2–3 times their own diameter apart, the lower epidermis glaucous . 2. *calophyllum.*

Filaments of the stamens hairy in their lower part :
Corolla tube about 2 cm. long ; anthers 3–4 mm. long . . . . . 3. *brachysiphon.*
Corolla tube over 3 cm. long ; anthers 5–6 mm. long :
Stamens 25 ; leaves rather small, oblong-lanceolate, obtuse and rounded at both ends . . . . . 4. *polyandrum.*
Stamens 15–21 :
Scales of the winter flower-bearing buds not pubescent . . . . . 5. *manipurense.*
Scales of the winter buds silky-pubescent towards the top . . . . . 6. *crassum.*

II. **Megacalyx.**—*Petiole convex and not grooved on the upper side (very slightly so in* R. megacalyx) *; leaves usually large and strongly nerved, with the midrib raised on the upper surface ; stamens* 10–15, *the filaments always hairy ; ovary cells* 5 ; *calyx large, with broad lobes* 1–2.3 cm. long.

Stamens 15 ; corolla lepidote all over the outside ; leaves large, 15–19 cm. long, oblong-elliptic, with 18–20 lateral nerves ; petioles 2.5–4 cm. long . . . . . 7. *excellens.*
Stamens 10 :
Pedicels and calyx not lepidote ; calyx divided to about the middle, with very broad lobes ; capsule 2 cm. long, scarcely longer than the persistent calyx lobes . . 8. *megacalyx.*
Pedicels and lower part of the calyx lepidote :
Corolla lepidote all over the outside ; capsule 4.5 cm. long, curved, acute ; Chinese (Kweichow) species . 9. *liliiflorum.*
Corolla not lepidote or only on the lower part of the tube or at the base ; Indian species :
Pedicels softly pubescent as well as lepidote ; young or one-year-old branchlets bristly hairy ; calyx lobes glabrous on the margins :
Corolla cream, with broad red lines outside down the middle of the lobes and down the tube . . 10. *rhabdotum.*
Corolla white, sometimes tinged with rose outside . . . . . 11. *Dalhousiae.*
Pedicels only lepidote :
Corolla about 7–8 cm. long ; calyx lobes rather densely ciliate ; lateral nerves of leaves 12–16 . 12. *Lindleyi.*
Corolla about 10 cm. long or more ; calyx lobes sparingly or scarcely ciliate ; lateral nerves 10–12. 13. *Nuttallii.*

III. **Ciliicalyx.**—*Petiole with a V-shaped groove on the upper concave side ; leaves medium-sized or rather small, the midrib impressed above ; stamens* 10 (–13) ; *ovary cells* 5–7 (*frequently* 6) ; *calyx usually poorly developed and often ciliate.*

Style quite smooth its full length, neither hairy nor lepidote ; calyx lobes broad, 8–10 mm. long ; corolla not lepidote outside ; leaves and branchlets bristly hairy ; Sikkim species . 14. *ciliatum.*
Style slightly lepidote at the base ; calyx lobes large, about 8 mm. long, densely fringed with crinkly hairs, lepidote outside ; corolla densely lepidote outside, yellow ; leaves small, like the young branchlets bristly with stiff hairs ; W. Yunnan species . . . . . 15. *Valentinianum.*

Style mostly lepidote well above the base ; calyx lobes usually rather small :

* Corolla tube not lepidote outside or only slightly so at the base of the lobes :

Some of the calyx lobes connate to above the middle, nearly 1 cm. long ; leaves oblanceolate or oblong-oblanceolate, broader above the middle ; S.W. Burmese species . 16. *Cuffeanum.*

All the calyx lobes more or less equally separated, never more than 6 mm. long ; calyx sometimes saucer-shaped and undulate :

Burma and Siam species ; leaves more or less obovate-oblanceolate, narrowed from about or above the middle to the base, obtusely triangular-acuminate at the apex ; ovary 5-celled ; capsule 3 cm. long ; young shoots not setose . . . . . 34. *Veitchianum.*

Yunnan (and Szechuan ?) species ; leaves mostly rather acutely triangular-acuminate ; ovary usually 6-celled ; capsule 1.2–2 cm. long ; young shoots mostly setose :

Leaves more or less elliptic, equally pointed to both ends, widest at the middle ; scales on the lower leaf surface more than their own diameter apart ; W. Yunnan species . . . . . 17. *ciliicalyx.*

Leaves as in previous species ; scales very unequal, less than their own diameter apart ; young branchlets very bristly ; (Szechuan ? species) . . . . 18. *pseudociliicalyx.*

Leaves obovate-oblanceolate, long-cuneate at the base, widest above the middle ; leaf-scales about their own diameter or less apart ; young branchlets sparingly strigose ; N.E. Yunnan species . . . . . 19. *missionarum.*

Kweichow species ; leaves oblanceolate or oblong-oblanceolate, shortly rounded-triangular at the apex ; shoots bristly hairy ; style lepidote in the lower $\frac{2}{3}$; capsule 2·5 cm. long 20. *Lyi.*

** Corolla tube more or less densely lepidote all over the outside or down one side :

† Leaves elliptic or ovate, broadest below or at the middle :

Calyx ciliate ; leaves ovate, acutely triangular-acuminate, broadly rounded at the base ; scales on the lower surface of the leaves nearly contiguous ; flowers white, rosy outside ; calyx setose-ciliate ; Yunnan species . . 21. *roseatum.*

Calyx not or very sparingly ciliate ; leaves elliptic or oblong elliptic ; scales laxer on the lower surface of the leaves :

Leaves more or less rounded to a blunt apex ; pedicels inserted on a softly tomentose " foot " 1.5 mm. long, from which they fall off ; flowers white, yellow inside the base ; W. Yunnan species ; calyx not ciliate . 22. *lasiopodum.*

Leaves rather abruptly and subacutely acuminate ; pedicels without a tomentose " foot " ; flowers white, tinged with pink, with an orange mark inside the lower petals ; calyx sparingly ciliate ; N. Burma species . 23. *dendricola.*

†† Leaves obovate to oblanceolate or linear, widest above the middle :

§ Leaves not linear or much elongated, usually well over 1.5 cm. broad :

|| Corolla flesh-coloured or white or flushed with pink, sometimes with a yellow spot within the base :

Corolla densely pubescent-villous all over the tube outside ; Siamese species . . . . 24. *Ludwigianum.*

Corolla not pubescent except sometimes near the base :
= Leaf-scales dense below, usually much less than their diameter apart :
Leaf-scales contiguous or very nearly so :
Leaves oblanceolate, long-tapered to the base ; S. Yunnan (Szemao) species 25. *rufosquamosum.*
Leaves obovate, shortly narrowed to the base :
Leaves rounded triangular at the apex ; W. Yunnan species . . 26. *Scottianum.*
Leaves acutely triangular-acuminate :
Leaf-scales purplish below, small and rather fleshy, with the epidermis clearly visible between ; S. Yunnan . . 27. *pilicalyx.*
Leaf-scales brown below, fairly large and flaky, almost entirely hiding the epidermis ; anthers 7 mm. long ; Siamese species . . . . . 28. *Surasianum.*
Leaf-scales not nearly contiguous below :
One-year-old shoots very slightly or not at all bristly hairy :
W. Yunnan species ; leaves rather small, oblanceolate or obovate-oblanceolate ; flowers dull white, rosy outside ; corolla about 6 cm. long . . . . . 29. *supranubium.*
N. Siam species ; leaves obovate-oblanceolate, small ; flowers white ; corolla small, about 4 cm. long . . . . . 30. *Smilesii.*
N. Burma species ; flowers flesh-pink ; corolla about 6.5 cm. long . . . 31. *carneum.*
One-year-old shoots very densely bristly hairy ; leaves obovate ; flowers white, spotted with red inside ; Manipur species . 32. *Johnstoneanum.*
One-year-old shoots bristly ; leaves oblanceolate to oblong-oblanceolate ; flowers probably not spotted ; Kweichow (China) species . . . 20. *Lyi.*
≡ Leaf-scales 1–3 times their own diameter apart ; Assam and Burmese species :
Capsule 3 cm. long, very oblique at the base ; corolla tube scaly all over the outside ; leaves not setose on the margin ; Khasia Hills species 33. *inaequale.*
Capsule 3 cm. long, straight ; corolla tube scaly mainly on the dorsal (adaxial) side ; flowers white or tinged with pale green outside, the lobes with crinkled margins ; young branchlets not setose ; leaves distinctly more or less obovate ; Central and South Burma . . . . . 34. *Veitchianum.*
Capsule not known ; corolla tube scaly only on the dorsal (adaxial) side, colour not known ; young branchlets, leaves, and petioles with bristly hairs ; leaves elongate oblong-elliptic ; N. Burmese (Bhamo) species . . . . . 35. *Cubittii.*
Capsule 1.5–2 cm. long, straight ; corolla white and tinged with yellow and rose or red ; tube equally lepidote all over the outside, the lobes not or scarcely crinkled on the margins ; young branchlets and the

margins of the leaves nearly all setose pubescent; Khasia Hills species . . . 36. *formosum*.

|||| Corolla yellow or greenish-yellow:

Mature leaves densely lepidote on the upper surface, green below between the scales; inflorescence several-flowered; S.W. Burmese species . . 37. *burmanicum*.

Mature leaves more or less lepidote on the upper surface, glaucous below between the scales; inflorescence often 1-flowered; W. Yunnan species . 38. *pachypodum*.

§§ Leaves linear, acute, usually less than 1.5 cm. broad, 5–9 cm. long, the scales below about their own diameter apart; Assam (Khasia Hills) species . . 39. *iteaphyllum*.

1. **Rhododendron Maddeni,** Hook. f., Rhod. Sikkim Himal. p. 19, t. 18 (1851); Journ. Hort. Soc. Lond. vii. 79, 95 (1852); Hook. Bot. Mag. t. 4805 (1854); Fl. des Serres, t. 912 (1854); Rev. Hortic. 301, t. 16 (1855); Illustr. Horticol. t. 140 (1857); C. B. Clarke in Hook. f. Fl. Brit. Ind. iii. 472 (1882), incl. var. *calophylla* (partly); Millais, Rhodod. 206 (1917); *R. Jenkinsii*, Nutt. in Hook. Kew Journ. v. 361, incl. vars. (1853); Regel, Gartenfl. ix. 1, t. 277 (1860).

A much-branched shrub up to 2.75 m. high; branches erect, supple, covered with pale papery bark; older branchlets marked with the broadly triangular leaf-scars, the bark closely marked with small black spots; one-year-old branchlets laxly leafy, about 5 mm. thick, rather closely dotted with the minute dark-coloured remains of the fallen scales; young lateral branchlets closely covered with rust-coloured scales, not hairy. *Leaves* of the one-year-old shoots lanceolate or oblong-lanceolate, obtuse or subacute at the base, acutely shortly acuminate at the apex, averaging about 10–12 cm. long, and 3–4 cm. broad, the leaves from older parts of the shoots more elliptic and about 15 cm. long and 6.5 cm. broad, all firmly coriaceous, dull green and at length nearly glabrous above (at first fairly densely lepidote), completely covered below with very dense overlapping reddish-brown scales,* the latter with a membranous fringe nearly as broad as the nucleus; lateral nerves 8–10, very slender, slightly raised and forming a reticulate surface above, fainter beneath, in the older leaves several secondary lateral nerves appearing between the original ones; petiole 1.5–2.5 cm. long, closely punctulate with the remains of the scales. *Flowers* 2–4 in each inflorescence, all arising from the same level; floral buds broadly ovoid, about 2.5 cm. long and 1.5 cm. in diameter, the surrounding foliage leaves gradually becoming smaller inwards:

* When these scales fall off, as they frequently do in older leaves, they leave the lower leaf surface with a punctate appearance, the "pits" in this species appearing about their own diameter apart.

perulae in about 4–5 series, few, broadly ovate-orbicular, the outer leathery, minutely downy, all provided with small rather scattered scales except towards the margins, the latter very minutely fringed with extremely short hairs; scars of the fallen perulae very crowded (contiguous), longitudinally linear; pedicels stout, 1.3–1.5 cm. long, about 3.5 mm. thick, covered with small nearly contiguous scales, not hairy; bracts not seen. *Calyx* 5-lobed, the lobes frequently very unequal, broadly ovate to oblong, normally about 4 mm. long but occasionally the adaxial one elongated to 1.5 cm. long, rather densely scaly except towards the margin, not ciliate except the elongated one, which bears a few short hairs at its tip. *Corolla* tubular funnel-shaped, fleshy, white with a faint flush of rose on the outside of the lobes which are outermost in bud; tube 4.5 cm. long, slightly widened in the upper part, covered with scales outside about their own diameter apart; limb with a spread of 8–10 cm., nearly flat, 5-lobed, the lobes broadly suborbicular, about 4 cm. wide, with undulate margins, scaly outside except towards the margins. *Stamens* 20, about as long as the corolla tube; filaments glabrous; anthers 5 mm. long, orange-yellow. Ovary 10-celled, rather short for the size of the flower, covered with contiguous scales; style exserted, a little longer than the total length of the corolla, scaly its full length except where it expands into the large 5-lobed disciform stigma. *Capsule* oblong-ellipsoid, 2–2.5 cm. long, about 1.4 cm. thick, 10-celled. *Seeds* 3–4 mm. long, tailed-acuminate, scarcely winged.

SIKKIM. Very rare in thickets by the Lachen and Lachoong rivers at Choongtam, 6000 ft., fl. June to August, fr. November, J. D. Hooker (type). Choongtam, by the bridge, 5000 ft., fls., June 1910, W. W. Smith, 3347; without definite locality, G. H. Cave, 6734.

BHUTAN. Angduphorang (Angduphodang ?), 7000 ft., 3 ft. bush on dry hill side; fls. white, scented, with pink lines outside and yellow throat, 6th June 1915, R. E. Cooper, 3957. Tongsa, 7000 ft., September 1915, fr., R. E. Cooper, 4980. Timpu, 9000 ft., 8th August 1911, young fr., R. E. Cooper, 3423. Punakha Timpu, 7000 ft., bush 6 ft., fls. white, 6th June 1914, R. E. Cooper, 1292. Yonbo La, 7500 ft., 28th May 1905, J. C. White, 17. Bhutan, without definite locality, Griffith, 1134, 2254; Booth.

This species was named in compliment to Major Madden of the Bengal Civil Service, of whom Sir J. D. Hooker * says "a good and accomplished botanist, to whose learned memoirs on the plants of the temperate and tropical zones of north-west Himalaya the reader may be referred for an excellent account of those regions."

* Sikkim Rhod. p. 19.

R. Maddeni is well worth cultivating, but except in the warmer parts of these islands it requires the shelter of a cool greenhouse. At Kew it flourishes in the Himalayan House. In the herbarium there is a dried specimen with semi-double flowers which occurred at Kew in July 1882. One of the leaves of this is remarkable in that it is obovate-orbicular, a character which appears to occur occasionally in garden forms inclined to doubling of their flowers.

In cultivated examples especially the leaf-scales are frequently laxer than in wild specimens, and I strongly suspect that this condition is brought about by change of environment. The calyx, too, seems to be very variable in garden plants of this species.

2. **Rhododendron calophyllum,** Nutt. in Hook.

Kew Journ. Bot. v. 362 (1853).

Leaf rather widely obovate, narrowed to the base, rounded to a shortly mucronate obtuse apex, 9.5 cm. long, 4.8 cm. broad, glabrous and laxly reticulate above, very glaucous and rather laxly lepidote beneath, the scales about 2–3 times their own diameter apart and very small, the epidermis very densely papillous between the scales with rod-like papillae; midrib a little impressed above, prominent beneath and scaly, about 2.25 mm. wide at the base, gradually tapered to the apex; lateral nerves about 6 on each side of the midrib, the lower ascending, the upper ones more spreading, slightly raised but covered with papillae below; petiole broken off but rather wide and finely channelled above, lepidote. *Inflorescence* 4–5-flowered (Nuttall). *Calyx* not seen, lobes short, sub-equal, obtuse (Nuttall). *Corolla* 7 cm. long, 5-lobed; tube broad, straight in the lower part, a little expanded above, 4 cm. long, about 1 cm. in diameter at the base, very densely scaly all over the outside; lobes ovate-rounded, 2.5–3 cm. long, about 2.5 cm. broad, densely scaly outside. *Stamens* probably more than 15; filaments unequal, the longest reaching to about the middle of the corolla lobes, glabrous; anthers about 7 mm. long. *Ovary* and *style* not seen. *Capsule* (according to Nuttall) "cylindric-ovate, obtuse, 10-celled."

BHUTAN. On the southern slope of the Oola Mountain, at about 6000–7000 ft., Booth.

The accompanying drawing shows part of the material (one leaf and two flowers) upon which the above description is based. The specimen is labelled "Rhod. calophyllum, Nutt. Bot. Mag., t. 5002, Hort. Nutt." It agrees with Nuttall's account of the

species, a transcription of which is given below.* C. B. Clarke's "R. Maddeni var. calophyllum" of the Flora of Brit. India is nearly all *R. Maddeni*. This meagre specimen is the only one I have seen of the true *R. calophyllum*, Nutt.; probably all so named in cultivation at the present day are *R. Maddeni*. The plant shown in the drawing cannot very well be the type

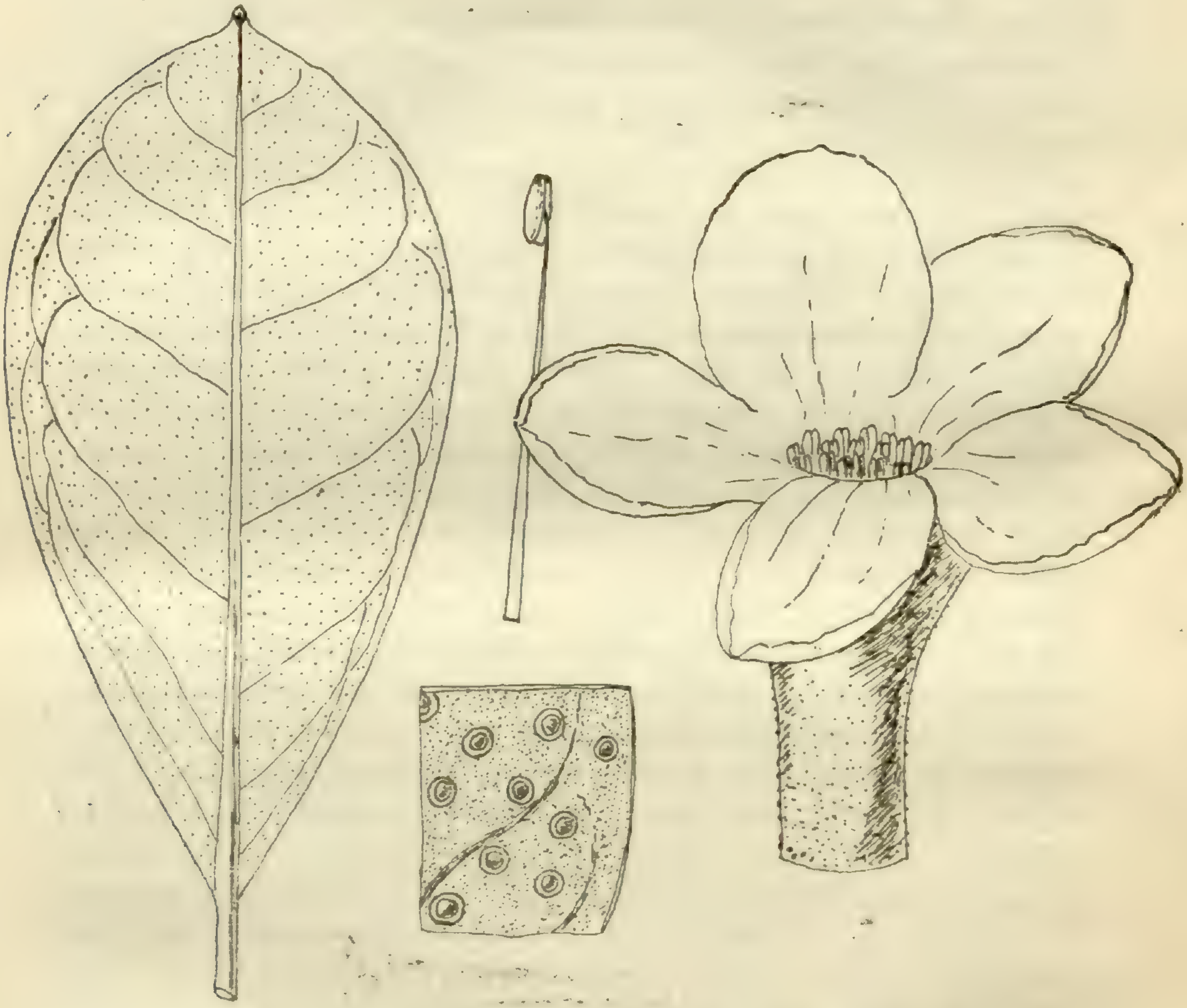

FIG. 1.—*Rhododendron calophyllum*, Nutt. (type). Nat. size.

of the Botanical Magazine, t. 5002, because the scales on the under surface of the leaves in that figure are shown to be nearly

* "*Rhododendron calophyllum*, Nutt.—Fruticosum: foliis brevi-petiolatis, oblongo-ovatis, subellipticis, acutis, basi subrotundis subtus glaucis squamosis; corymbis 4–5-floris; calycis laciniis brevibus, lobis subaequalibus obtusis; capsulis cylindraceo-ovatis obtusis 10-locularibus.

"Hab. In Bhotan, with *R. Jenkinsii*, from which it is perhaps not sufficiently distinct, though readily distinguished by the eye. The flowers of both are yet unknown, the specimens having been collected in the month of December. Mr Booth supposed, from the examination of the buds, that *R. Jenkinsii* would have yellow flowers; in the present species the bud-scales, in three specimens, are reddish-purple, indicating probably a red flower. The leaves are 3½–4 inches long, about 1½ inch wide, pointed, but not acuminate, also less scaly beneath."

contiguous, whilst in the specimen before us they are 2–3 times their own diameter apart. It should be noted in Nuttall's description (see below) that the leaves are described as being glaucous, and also as less scaly than in *R. Jenkinsii* (=*R. Maddeni*), points which fit the specimen shown in the drawing exactly.

3. **Rhododendron brachysiphon,** Balf. f. nom. nov.

R. brevitubum, Balf. f. et Cooper, in Notes, Roy. Bot. Gard. Edinb. x. 88 (1917), non J. J. Smith (1914).

A shrub about 2.5 m. high. *Branchlets* straight, sparingly leafy, the older parts grey and shining, punctate with the scars of the fallen scales, those a year old about 4 mm. thick and rather closely lepidote; axillary leaf-bearing buds still dormant or only just expanding at the time of flowering, the bud-scales densely lepidote outside, slightly ciliate. *Leaves* obovate or the larger ones more or less elliptic, 5.5–12.5 cm. long, 2.5–5 cm. broad, narrowed to the base, rounded to a small blunt mucronate apex, rather thinly coriaceous, glabrous and reticulate above when mature, very densely rusty-lepidote beneath, the scales nearly contiguous with a few larger ones scattered here and there, fleshy in the middle with a fairly wide membranous fringe, the epidermis between the scales rather laxly papillous; midrib sunken and closely lepidote on the upper surface, prominent below and rather laxly lepidote, 2 mm. wide at the base, gradually tapered to the apex; lateral nerves 6–8 on each side of the midrib, diverging from it at an angle of about 60°, slender, arcuate and ascending parallel with the margin, distinct below and a little flexuous; secondary nerves not visible; petiole up to 1 cm. long, channelled on the upper side, closely lepidote-punctate. *Inflorescence* 2–3-flowered; pedicels 0.5–1 cm. long, closely lepidote. *Calyx* about 7 mm. long, 5-lobed to near the base; lobes ovate-triangular, unequal, submembranous, glabrous except the lepidote base outside. *Corolla* 5-lobed, pink and scented, only 4.5 cm. long; tube 2 cm. long, lepidote outside and on the back of the lobes; lobes 2.5 cm. long, rounded. *Stamens* 20, unequal, exserted, reaching to above the middle of the corolla lobes; filaments slender, strigillose-pubescent in the lower third or half; anthers 3.5–4 mm. long. *Ovary* short, broadly ovoid, about 5 mm. long, rusty-lepidote; style about as long as the corolla, curved, laxly lepidote in the lower half, crowned by a large lobulate stigma. *Capsule* not seen.

BHUTAN. Punakha, 6000–7000 ft., bush 8 ft. high, on steep hillsides, fls. 27th June 1915, R. E. Cooper, 3936 (Herb. Edinb.).

4. **Rhododendron polyandrum,** Hutchinson, n. sp.*

A bush 1 m. high; older branches covered with dull grey bark finely punctulate with small black spots; one-year-old branchlets finely punctulate-lepidote, leafy at the top. *Leaves* oblong or oblong-lanceolate, rounded-obtuse at both ends, bluntly mucronate at the apex, 6–8 cm. long, 2.5–3 cm. broad, rigidly coriaceous, minutely lepidote and glossy-reticulate on the upper surface, densely lepidote beneath, the scales contiguous or nearly so, with dark brown central body and much paler and nearly invisible membranous fringe, the epidermis between the scales rather coarsely papillous; midrib impressed above, prominent and rather sparingly lepidote beneath; lateral nerves about 6 on each side of the midrib, scarcely visible below; petioles 8–10 mm. long, lepidote, grooved above. *Inflorescence* about 5-flowered, the pedicels arising from approximately the same level; scales of the flower buds leathery, minutely puberulous and a little lepidote outside, not ciliate; pedicels unequal, stout, 1.5–2 cm. long, lepidote with light-coloured scales. *Calyx* unequally 5-lobed, much longer on the dorsal (adaxial) side, up to 3 mm. long, lepidote outside, with membranous margins. *Corolla* about 7 cm. long, lepidote all over the outside except towards the margins of the lobes; tube apparently almost straight, 3.5 cm. long, about 1 cm. broad when dried; lobes 5, broadly oblong. *Stamens* 25, exserted; filaments very slender, hairy in the lower half with broad membranous flake-like hairs; anthers 5 mm. long. *Ovary* 12-celled, about 6 mm. long, densely lepidote, gradually passing into the style; style

* *Rhododendron polyandrum,* Hutchinson, sp. nov.; affinis *R. manipurensi,* Balf. f. et Watt, sed foliis oblongis vel oblongo-lanceolatis utrinque rotundato-obtusis staminibus 25 differt.

Frutex 1 m. altus; ramuli vetustiores cortice cinereo minute nigro-punctato obtecti, annotini minute punctato-lepidoti, superne foliati. *Folia* oblonga vel oblongo-lanceolata, utrinque rotundato-obtusa, apice obtuse mucronata, 6–8 cm. longa, 2.5–3 cm. lata, rigide coriacea, supra minute lepidota et nitido-reticulata, infra dense lepidota squamis contiguis vel fere contiguis corpore centrali atro-brunneo margine membranaceo, epidermide crasse papillosa; costa media supra impressa, infra prominens et parce lepidota; nervi laterales utrinsecus circiter 6, infra vix evidentes; petioli 8–10 mm. longi, lepidoti, supra canaliculati. *Inflorescentia* terminalis, circiter 5-flora, pedicellis subumbellatis; gemmarum floriferarum squamae coriaceae, extra minute puberulae et parum lepidotae, eciliatae; pedicelli inaequales, robusti, 1.5–2 cm. longi, squamulis pallidis lepidoti. *Calyx* inaequaliter 5-lobatus, lobo dorsali (adaxiali) multo longiore, usque ad 3 mm. longus, extra lepidotus, margine membranaceo. *Corolla* circiter 7 cm. longa, extra ubique lepidota; tubus rectus, 3.5 cm. longus, sicco circiter 1 cm. latus; lobi 5, late oblongi. *Stamina* 25, exserta; filamenta gracilia, in parte inferiore pilis latis membranaceis pubescentia; antherae 5 mm. longae. *Ovarium* 12-loculare, circiter 6 mm. longum, dense lepidotum, in stylum sensim angustatum; stylus corollae fere aequilongus, fere ad apicem lepidotus, stigmate late lobulato coronatus. *Capsula* non visa.

nearly as long as the corolla, lepidote close up to the broad lobulate stigma.

BHUTAN. Chapcha Timpu, 8500 ft., bush 3 ft. high on hill top, fls. white, 8th July 1914, R. E. Cooper, 1454 (Herb. Edinb.).

FIG. 2.—*Rhododendron polyandrum*, Hutchinson, n. sp. Nat. size.

5. **Rhododendron manipurense,** Balf. f. et Watt, in Notes, Roy. Bot. Gard. Edinb. x. 119 (1917). *R. Maddeni*, var. *obtusifolium*, Hutchinson in Bot. Mag. t. 8212 (1908).

A much-branched tortuous tree or shrub ; young branchlets lepidote with imbricate scales, girt at the base by the persistent crowded outer scales of the leaf-buds, sometimes a few of the inner bud-scales also persisting ; one-year-old branchlets about

6 mm. in diameter, dark red or greyish-brown, lepidote with brownish scales, the older branches becoming glabrous ; axillary leaf-bearing buds still dormant and very small at the time of flowering, ovoid-globose, densely lepidote outside ; outer perulæ of the terminal leaf-bearing buds more or less leaf-like, and gradually decreasing in size and becoming scale-like. *Leaves* elliptic or oblong-elliptic, occasionally obovate or rarely one or two of the lower ones suborbicular, rounded at the base, more or less rounded to an obtuse mucronate apex, up to 18 cm. long and 8 cm. broad, very thick and coriaceous, shining and impressed-reticulate on the upper surface, very densely lepidote below, the scales contiguous or nearly so and variable in size from larger blacker scattered ones to small brown ones, the epidermis conspicuously papillous ; midrib slightly sulcate above, very prominent beneath and lepidote ; lateral nerves about 10 on each side of the midrib and diverging from it at a wide angle, slightly prominent below ; petiole stout, up to 3 cm. long, very finely grooved on the upper side, densely lepidote. *Inflorescence* 4–5-flowered, the pedicels arising from about the same level ; flower-bearing buds large, ovoid, viscid, the outer scales very thick and leathery and lepidote towards the middle ; pedicels very stout, about 1 cm. long, 3-4 mm. thick, lepidote. *Calyx* about 1.5 cm. long, 5-lobed to near the base ; lower basal portion lepidote outside ; lobes more or less oblong, membranous, at first lepidote outside but soon glabrescent, the posterior and lateral ones a little shorter and broader than the others. *Corolla* large and pure white, up to 10 cm. long ; tube rather narrowly funnel-shaped, longer than the lobes, about 6.5 cm. long, lepidote all over the outside ; lobes 5, rounded, about 3 cm. broad, lepidote outside mainly towards the middle. *Stamens* 17–20, exserted ; filaments pubescent in the lower half ; anthers 5 mm. long. *Ovary* 12-celled, about 8 mm. long, densely lepidote ; style nearly as long as the corolla, lepidote nearly to the apex, crowned by a very large lobulate disk-like stigma. *Capsule* 2–4 cm. long, about 1.5 cm. thick, lepidote, the central axis capped by the lower persistent portion of the style.

MANIPUR. Naga Hills : Japvo Mountain, 8000–10,000 ft., fr., 9th March 1882, G. Watt, 6461 ; 10,000 ft., fls. 22nd July 1882, Dr W. Coury in Herb. G. Watt, 7333. Japvo, 9900 ft., fr., 25th October 1885, C. B. Clarke, 41348. Sirohifurar, 8000 ft., a common Rhododendron on the smaller peak, fr., 12th April 1882, G. Watt, 6461. Ching Sow, 8000–8500 ft., old fr., 14th to 16th April 1882, G. Watt, 6512, 6513. Keyang and the ranges approaching Sarameti into Burma, 9500 ft., in bud 22nd April 1882, G. Watt, 6703 (Herb. Kew).

6. **Rhododendron crassum,** Franch. in Bull. Soc. Bot. France, xxxiv. 282 (1887); Bean in Kew Bull. 1914, 201; Millais, Rhododendrons, 149 (1917).

A shrub or tree up to 6.5 m. high; older branchlets covered with minutely punctate grey bark; one-year-old branchlets closely covered with small scales; axillary leaf-bearing buds minute and still dormant at the time of flowering. *Leaves* rather crowded and whorled, lanceolate or obovate-oblanceolate, mostly more or less triangular and obtusely mucronate at the apex, subcuneate at the base, 6–12 cm. long, 2–7 cm. broad, very thick and rigidly coriaceous, lepidote above especially when young and later mainly towards the midrib, at length rather glossy and reticulate, densely lepidote below, the scales ferruginous, unequal, and less than their own diameter apart or more or less contiguous, with rather narrow membranous fringe; midrib impressed above, prominent below and lepidote; lateral nerves 8–12 on each side of the midrib; slender but fairly distinct below; petiole about 1.5–2 cm. long, stout, closely lepidote, grooved on the upper side. *Inflorescence* 3–5-flowered, the pedicels arising from approximately the same level; bud-scales very thick and leathery, the outer ones rounded, laxly lepidote and minutely puberulous outside, the inner ones widely bilobed at the apex and silky villous outside towards the top; pedicels stout, 1–1.5 cm. long, densely lepidote especially towards the apex. *Calyx* rather variable, up to 1.3 cm. long, 5-lobed to near the base, lobes membranous, more or less oblong, glabrous. *Corolla* white, 6–9 cm. long, rather narrowly funnel-shaped, densely lepidote all over the outside; tube longer than the lobes; lobes 5, oblong or broadly elliptic, with wavy margins. *Stamens* 15–21,* longer than the corolla tube; filaments strigillose-pubescent in their lower half; anthers about 6 mm. long. *Ovary* 10-celled, densely scaly, short and broadly ovoid; style a little shorter than the corolla, stout, lepidote to near the apex, crowned by a large disk-like stigma. *Capsule* straight, 3 cm. long, about 1.4 cm. thick, lepidote, 10-ribbed or valved.

WESTERN YUNNAN. Hou-tien-pa, Mt. Tsang-chan, above Tali, 7500 ft., Delavay, 2112 (type in Herb. Paris)—not seen. Amongst shrubs on Mt. Tsang-chan, 9000 ft., fls. 15th June 1889, Delavay, 4157. Shady moist situations in pine forests on the eastern flank of the Tali Range, lat. 25° 40′ N., 11,000–12,000 ft., shrub 15–20 ft., fls. rosy-white, August 1906, G. Forrest, 4139. Eastern flank of the Tali Range, lat. 25° 40′

* Franchet describes the number of stamens as 13, but in the specimen at Kew there are 20. I have not found fewer than 15 in any specimen of *crassum*.

N., 12,000 ft., amongst scrub and rock, shrub 4–8 ft., fls. white, washed with rose at the base, fragrant, July 1910, G. Forrest, 6759; same region, 10,000 ft., June 1913, G. Forrest, 11672; June 1914, G. Forrest, 13457. Western flank of the Shweli-Salween Divide, lat. 25° 20′ N., 9000–10,000 ft., amongst scrub, shrub 4–8 ft., in fruit, December 1912, G. Forrest, 9431. Shweli-Salween Divide, lat. 25° 30′ N., 10,000 ft., open rocky slopes and in thickets, shrub 4–6 ft., fls. white, flushed with rose outside, August 1917, G. Forrest, 15887. Mekong-Salween Divide, lat. 28° 12′ N., 10,000 ft., on ledges of cliffs and humus-covered boulders, shrub 2 ft., fls. fragrant, creamy-white, July 1917, G. Forrest, 14239.

UPPER BURMA. Ridge of Naung-chaung, Nwai Divide, on open granite ridge in forest, 8000–9000 ft., fls. pure white, marked with pale yellow at extreme base of corolla, very fragrant, 17th July 1914, Kingdon Ward, 1817 (Herb. Edinb.). Hpimaw, open forest, on damp shady limestone cliffs, small bush, with spreading loose habit, 6–10 ft. high, fls. white, not fragrant, 9th July 1914, Kingdon Ward, 1757 (Herb. Edinb.).

It is not without considerable hesitation that I have included in the above Mr Kingdon Ward's specimens from the Nwai Divide and Hpimaw, Burma. They are more robust and their leaves are larger than in the Yunnan plants, but I can discover no real difference to separate them.

7. **Rhododendron excellens,** Hemsl. et E. H. Wils. in Kew Bull. 1910, 113.

A shrub about 3.3 m. high; one-year-old branchlets dark purple, slightly flexuous, about 6 mm. thick in the middle, terete, rather densely covered with small very dark ferruginous scales; axillary leaf-buds very small (about 2 mm. in diameter) at the time of flowering, subglobose, densely lepidote, the bud-scales glabrous towards the margin and very minutely ciliolate. *Leaves* large, oblong-elliptic, rounded at both ends, slightly unequal at the base, obtusely mucronate at the apex, 15–19 cm. long, 4–5.5 cm. broad, coriaceous, glabrous and dull above, somewhat glaucous and rather densely lepidote below, the scales about their own or a little less than their own diameter apart (probably almost contiguous in younger leaves), the epidermis densely papillous between the scales; midrib slightly raised above, a little scaly towards the base, very prominent and rounded below, about 4 mm. thick at the base, gradually tapered to the apex; lateral nerves about 18–20, distinct on the upper, prominent on the lower surface, spreading from the midrib at a wide angle, slightly arcuate, looped and branched

FIG. 3.—*Rhododendron excellens*, Hemsl. and Wils. Nat. size.

towards the margin, the junctions of the nerves forming a distinct coarsely crenate intramarginal nerve; transverse nerves faint and inconspicuous; petioles terete, about 3.5 mm. thick, dark purple, covered with small scales and at length punctate with their impressions. *Inflorescence* 3–4-flowered, the pedicels arising from about the same level; scars of the fallen bud-scales very dense, transversely linear, straw-coloured; pedicels stout, 2 cm. long, about 4 mm. thick, densely covered with dark red rather fleshy scales. *Calyx* 1–1.5 cm. long, tubular and slightly scaly outside at the base, the lobes rounded, glabrous outside, very slightly or not at all ciliate on the margins. *Corolla* white (Henry), rather widely funnel-shaped, gradually widened from the base upwards, rather densely scaly outside the tube and up the back of the lobes; tube 7.5–8 cm. long, about 1 cm. in diameter at the base, 7 cm. broad at the top when flattened out; lobes 5, shallowly and widely emarginate, about 2.5 cm. long and 3.5 cm. broad. *Stamens* 15, much shorter than the corolla tube; filaments rather densely pubescent in the lower two-thirds; anthers large, 1.2–1.3 cm. long. *Ovary* 5-celled, 1.5 cm. long, gradually narrowed into the style, densely covered with reddish-brown scales; style slightly exceeding the corolla tube, 8.5–9 cm. long, scaly for about the lower $\frac{1}{3}$ of its length, glabrous above, stout, crowned by a very large lobulate disk-like stigma about 7 mm. in diameter. *Capsule* not seen.

SOUTH YUNNAN. South of the Red River from Mengtze; "only one specimen brought by a native, shrub 10 ft., fls. white," 7th July, A. Henry, 13666 (Herb. Kew; photograph in Herb. Edinb.).

I have given a new and more detailed description of this truly magnificent species because there is so far only one dried specimen in existence. As it flowers in July in S. Yunnan, it would probably also flower late in cultivation.

8. **Rhododendron megacalyx,** Balf. f. et Ward in Notes, Roy. Bot. Gard. Edinb. ix. 246 (1916).

A bushy tree of 3–5 m.; one-year-old branchlets dark brownish-purple, terete, rather laxly marked with the remains of small scales; axillary leaf-buds already elongating at the time of flowering, then about 1.5 cm. long, their scales slightly lepidote on the back but not ciliate. *Leaves* fairly large, elliptic or slightly obovate-elliptic, slightly narrowed to the rounded base, rounded to a sunken tip at the apex, 11–14.5 cm. long, 4–7 cm. broad, rather rigidly coriaceous, glabrous and dull above when mature (densely lepidote above when young), glaucous and densely lepidote below, the scales small and much

sunken, about their own diameter apart, with scarcely any membranous fringe; midrib impressed above, very prominent below, about 4 mm. wide at the base, gradually tapered to a

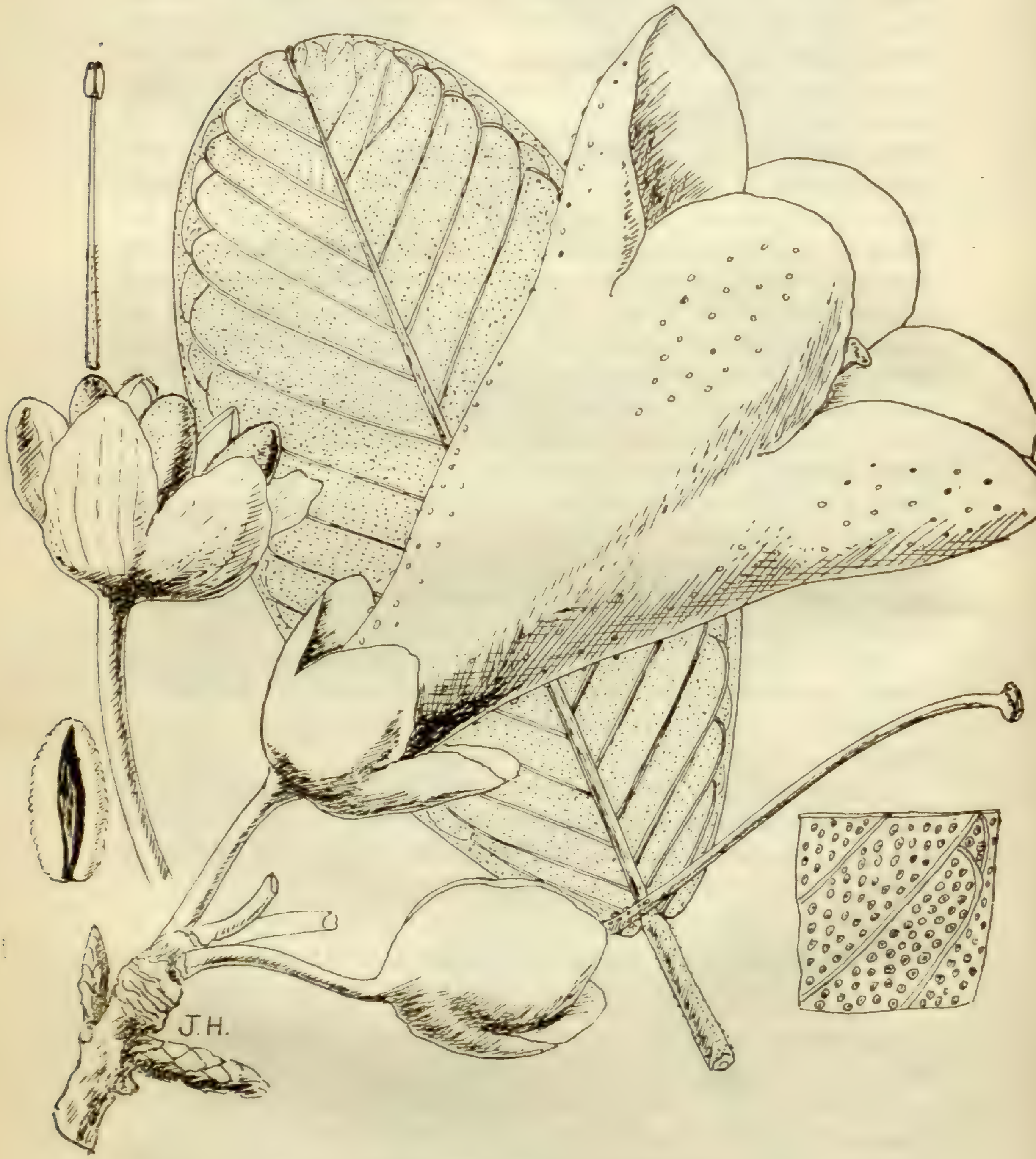

FIG. 4.—*Rhododendron megacalyx*, Balf. f. Nat. size.

small rounded callous sunken apex, very slightly lepidote below; lateral nerves about 15 on each side of the midrib, diverging from the midrib at an angle of 45°, very prominent below, straw-coloured, sparingly lepidote, branched and faintly looped

towards the margin; secondary nerves slender and inconspicuous, more or less parallel; petioles terete except for a shallow groove on the upper side, about 3 mm. thick, dark purple, covered with fairly close small whitish scales or punctate with their remains. *Inflorescence* about 5-flowered, the pedicels arising from rather different levels (very shortly racemose); scars of the fallen scales dense and contiguous, transversely linear, straw-coloured; pedicels fairly stout, 2.5–3 cm. long, about 2.5 mm. thick, probably at length nodding and curved, quite glabrous. *Calyx* 2.3 cm. long, campanulate, with a remarkably long tube about 1.5 cm. long, glabrous outside; lobes 5, very broadly ovate, rounded at the apex, about 1.3 cm. long and up to 1.5 cm. broad, not ciliate. *Corolla* white, with a sweet nutmeg-like smell (Ward), broadly funnel-shaped-campanulate, probably slightly asymmetrical, laxly scaly mainly in line below and on the back of the lobes; tube 6 cm. long, rather abruptly constricted towards the base, nearly 1 cm. in diameter at the base, about 8 cm. broad at the top when flattened out; lobes 5, broadly semicircular, about 3 cm. broad, very thin when dry. *Stamens* 10, a little shorter than the corolla tube; filaments slender, unequal, pubescent in the lowermost fourth of their length; anthers comparatively small, about 5 mm. long. *Ovary* 5-celled, 7 mm. long, abruptly contracted into the style, densely lepidote; style curved, a little longer than the corolla tube, with a few white scattered scales only towards the base, glabrous above, fairly stout, crowned by a slightly lobulate stigma about 5 mm. wide when flattened out. *Capsule* enclosed by the persistent rigidly membranous calyx lobes, 2 cm. long, covered with golden somewhat glandular scales.

EAST UPPER BURMA. Nwai Valley; bushy tree of 15–25 ft., in rain forest, rather open ground, by stream, 7000–8000 ft., flower white, smelling very sweetly of nutmeg, 4th June 1914, **Kingdon Ward, 1628 (Herb. Edinb.).**

9. **Rhododendron liliiflorum,** Léveillé in Fedde, Repert. xii. 102 (1913).

Branchlets not seen. *Leaves* (seen only in a fragmentary condition) oblong-lanceolate, slightly narrowed to the base, apex not seen but evidently subacute, 7–14 cm. long, 2–4 cm. broad, rigidly coriaceous, dull and impressed-reticulate on the upper surface, glabrous except for the finely scaly lower portion of the midrib, finely lepidote below, the scales about their own diameter apart, small and equal in size, reddish-brown, glistening when dry, fleshy in the middle, with a rather narrow membranous

fringe, the epidermis very slightly papillous between the scales; midrib slightly raised in a groove, raised below, rather densely covered with a little larger scales than on the leaf surface, about 2.25 mm. broad at the base, gradually tapered to the apex; lateral nerves probably about 10 (in one small leaf there are 8), slightly impressed above, a little prominent below, diverging

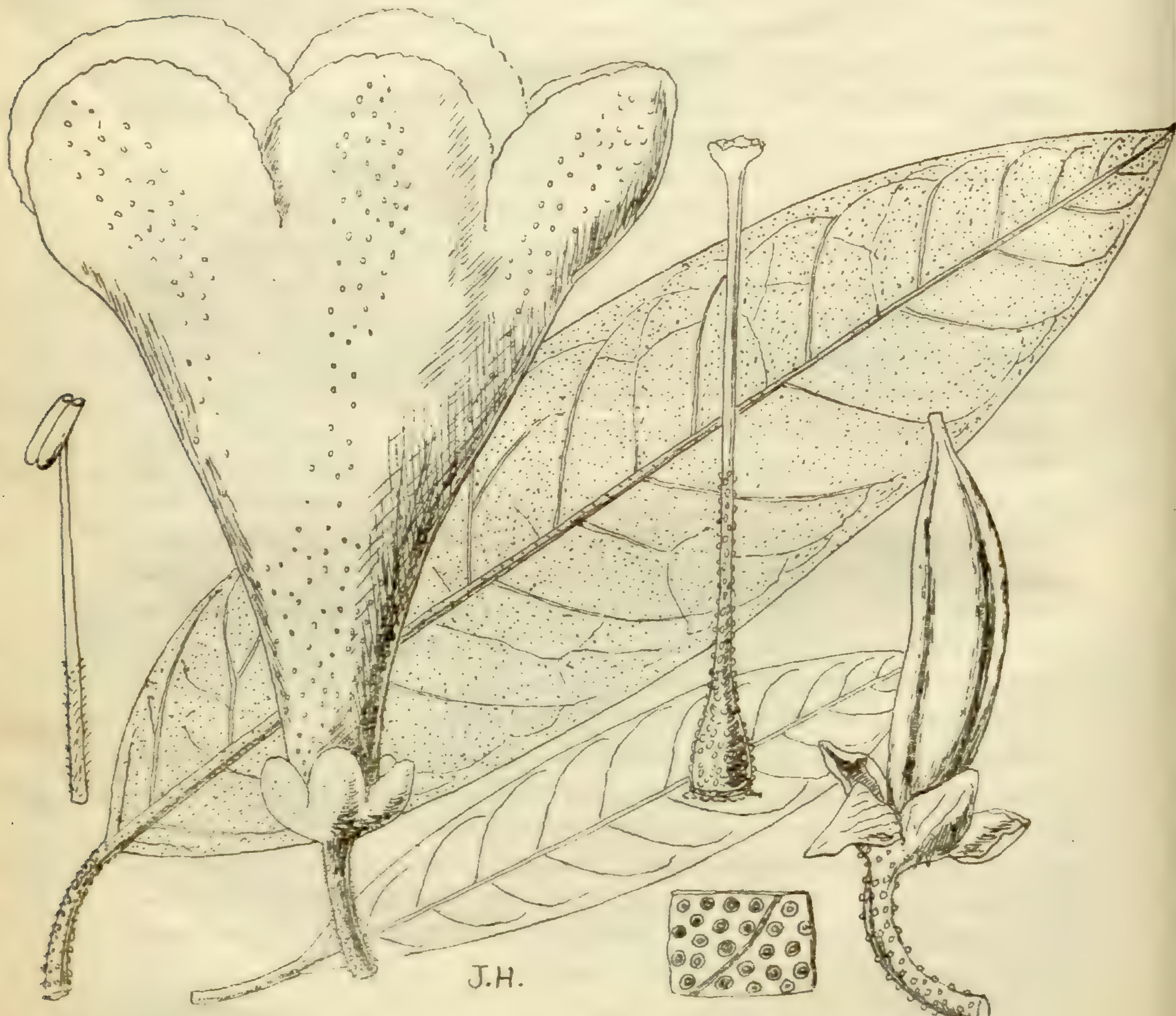

FIG. 5.—*Rhododendron liliiflorum*, Lév. Nat. size.

from the midrib at an angle of about 60°, slightly flexuous, faintly looped towards the margin; secondary nerves scarcely visible below; petiole 2.5 cm. long, nearly 3 mm. thick at the base, closely scaly, apparently not grooved on the upper side, reddish-purple. *Pedicels* (length ?) rather closely scaly, about 3 mm. thick at the tip. *Calyx* 1 cm. long, lobed to nearly the base on one side, on the other the lobes connate nearly their full length, very broadly oblong, rounded at the apex, with crenulate (probably at first scaly) margins, membranous, about

7 mm. broad, sparingly lepidote all over the outside but more densely so towards the base. *Corolla* white, scented (Cavalerie), tubular below, widely funnel-shaped from about 2 cm. above the base; tube 7 cm. long, 1 cm. diameter at the base, 6 cm. broad at the top when flattened out, rather densely lepidote outside with small fleshy scales; lobes 5, broadly semicircular, about 3 cm. broad and 2 cm. long, slightly fringed with short hairs, scaly outside. *Stamens* 10, much shorter than the corolla tube, nearly equal; filaments rather densely woolly-hairy in the lower third of their length; anthers large, about 8.5 mm. long. *Ovary* scaly, probably 5-celled (see capsule); style about as long as the corolla tube, 6 cm. long, rather densely scaly in the lower half, fairly stout, crowned by a large lobulate "fist-like" stigma about 6 mm. wide. *Capsule* 5-celled, with 5 rounded ribs, curved, acuminate, about 4.5 cm. long, 1.3 cm. broad, rather closely lepidote with small fleshy scales, girt at the base by the persistent rigidly chartaceous strongly striate calyx lobes.

KWEICHOW. Pin-Fa: Yuin-Ou-chau, "fl. blanches, odorantes," 3rd June to 15th July 1902, J. Cavalerie, 54 (Herb. Edinb.).

The presence of this species, apparently a very beautiful one, and perhaps hardy, in Kweichow is interesting, in that it extends the distribution of the Maddeni series very much farther eastward.

I have drawn up the above description from an imperfect specimen (see fig. 5) in the Edinburgh Herbarium. This material consists of two fragmentary leaves, one nearly whole, and a single but perfect flower, and a fine capsule. The capsule is remarkable in being curved, strongly ribbed, and tipped by the persistent base of the style, whilst at the base it is girt by the somewhat toughened persistent calyx lobes which become strongly striate.

R. liliiflorum is undoubtedly a close ally of *R. excellens*, Hemsl. and Wils., both of which would be very desirable for cultivation, as they are about the finest of the series and late flowering.

10. **Rhododendron rhabdotum,** Balf. f. et Cooper in Notes, Roy. Bot. Gard. Edinb. x. 141 (1917).

A tree 4 m. high; one-year-old branchlets rather slender, reddish-brown, very sparingly scaly, with a few rather long setose hairs towards the apex, the young branchlets densely scaly and bristly with hairs; axillary leaf-buds very small (about 1.5 mm. in diameter) and globose at the time of flowering,

the scales apparently not lepidote. *Leaves* fairly large, obovate-oblong-elliptic, slightly narrowed to an obtuse or subacute base, rounded to a small blunt callous tip, 9–14 cm. long, 3–4.8 cm. broad, rather thinly coriaceous, glabrous and dull green above when mature (at first rather densely scaly), laxly reticulate, glaucous-green below and lepidote, the scales about 3 sizes and always more than their own diameter apart, rather fleshy in the middle with a narrow membranous fringe, the epidermis between the scales densely papillous, the papillae pale coloured and rod-like; midrib slightly raised above, very prominent and slightly scaly below, about 2.25 mm. broad at the base, gradually tapered to the apex; lateral nerves about 9–10 on each side of the midrib, like the veins slightly raised and distinct on the upper surfaces, prominent but slender and flexuous on the lower surface, straw-coloured, diverging from the midrib at an angle of about 60°, arcuate, rather faintly looped towards the margin; secondary nerves few and rather faint; petioles 1.5 cm. long, about 3 mm. thick at the base, subterete, apparently not grooved on the upper side, slightly scaly when mature, setose on the edges and densely scaly when young. *Inflorescence* probably very few-flowered (only 3 flowers seen), the pedicels arising from the same level; scars of the fallen bud-scales rather broadly transversely linear, contiguous, pale straw-coloured; pedicels 1.7 cm. long, 2.5 mm. thick, rather densely scaly and softly pubescent. *Calyx* 1 cm. long, 5-lobed to nearly the base, scaly outside only at the base, the lobes oblong or oblong-elliptic, about 9 mm. long and 4–5 mm. broad, membranous, softly and thinly pubescent about the middle outside, very finely and inconspicuously ciliate around the apex, glabrous within, striate. *Corolla* cream-coloured with red lines down the back of the lobes, gradually funnel-shaped from the base, glabrous outside; tube 8 cm. long, about 1 cm. in diameter at the base, nearly 8 cm. wide at the throat when spread out; lobes 5, with rather shallow sinus between, about 1.5 cm. long and about 3.5 cm. broad, not at all emarginate. *Stamens* 10, slightly longer than the corolla tube; filaments slender, woolly-pubescent in their lowermost third; anthers large, 1–1.2 cm. long. *Ovary* 5-celled, conical, 1 cm. long, gradually narrowed into the style, densely covered with overlapping scales; style slightly longer than the corolla, about 10 cm. long, rather slender, laxly scaly in the lower half, crowned with a lobulate stigma about 5 mm. broad. *Capsule* not known.

BHUTAN. Punakka, 8000 ft., on dry rocky faces, tree 12 ft., fls. 29th May 1915, R. E. Cooper, 3937.

11. **Rhododendron Dalhousiae,** Hook. f. Rhod. Sikkim, t. i, quoad icon. orig. in MSS., nec icon. ii. ed.; Hook. f. in Journ. Hort. Soc. Lond., vii. 77, 93 partim; Hook., Bot. Mag., t. 4718 (1853); Fl. des Serres, v. 460–468 (1849) partim; *R. macrocarpus*, Griff. Itin. Notes, 138.

An epiphyte on tree stems, rarely on rocks. *Branches* rather elongated, the older ones reddish-purple and smooth; one-year-old branchlets rather closely lepidote and bristly towards the apex; axillary leaf-bearing buds quite small and still dormant at the time of flowering, the covering scales slightly lepidote outside and fringed with a few hairs. *Leaves* obovate or oblanceolate, rounded to an obtuse hardened apex, cuneate at the base, 7–15 cm. long, 2.5–6 cm. broad, firmly coriaceous, at first densely scaly above but soon becoming glabrous and dull, mostly somewhat glaucous below and rather densely lepidote, the scales very small and unequal in size, fleshy in the middle, with a narrow membranous fringe, about their own diameter (or slightly more) apart, the epidermis between the scales very densely papillous with rod-like papillae; midrib raised on both surfaces, more prominent beneath and slightly lepidote, about 2 mm. broad at the base; lateral nerves about 10 on each side and diverging from the midrib at an angle of 40°–60°, forked and faintly looped towards the margin, prominent below but rather slender; secondary nerves not visible; petioles 1–1.5 cm. long, almost terete, not grooved above, rather densely covered when young with scales which soon fall off, mostly bristly with long hairs. *Inflorescence* about 5-flowered, the pedicels arising from approximately the same level; flower-bearing buds ovoid, about 4 cm. long just before opening, the scales not or only very slightly lepidote outside but fringed towards the mucronate tips with soft short white hairs, appressed-villous within the apex; scars of the fallen scales very high and contiguous, straw-coloured; pedicels 1–2 cm. long, softly pubescent and rather densely covered with small fleshy scales. *Calyx* about 1 cm. long, 5-lobed to nearly the base; lobes oblong or oblong-elliptic, rounded at the apex, up to 5.5 mm. broad, a little scaly towards the base, sparingly clothed about the middle outside with a few delicate hairs, not at all ciliate on the margins. *Corolla* white, tinged with rose outside, fragrant, about 9 cm. long, gradually funnel-shaped from a fairly wide base; tube glabrous outside except for a few scales towards the base on the adaxial side, 6–8 cm. long, about 7–8 cm. in diameter at the mouth; lobes 5, broad, with undulate margins. *Stamens* 10, slightly longer than the corolla tube; filaments broad, pubescent towards the base; anthers large, about 1.3 cm.

long, chocolate-brown. *Ovary* 5-celled, rather abruptly tapered into the style, about 1 cm. long, very densely covered with closely packed scales; style curved about as long as the corolla, scaly in its lower two-thirds, crowned by the large depressed-globose somewhat horny stigma. *Capsule* about 4.5 cm. long, the valves rugulose-lepidote, slightly keeled, girt at the base by the persistent calyx. *Seeds* 2 mm. long, narrowly margined and shortly tailed, straw-coloured.

SIKKIM. Darjeeling, 6000–8000 ft., J. D. Hooker. Tonglo, May 1848, J. D. Hooker. Senchal Forest, 7000 ft., 13th May 1902, J. H. Lace, 2208 (Herb. Edinb.). Senchal, 8000 ft., fls. 23rd June 1912, Ribu and Rhomoo (Herb. Edinb.). Sikkim, without definite locality, G. H. Cave, 6735 (Herb. Edinb.).

BHUTAN. Chukka Timpu, 6000 ft., bush 8 ft., fls. yellow-primrose, 24th April 1915, R. E. Cooper, 3806 (Herb. Edinb.). Punakka, 6000–7000 ft., bush 8 ft., fruiting on steep dry hill-side, 26th June 1915, R. E. Cooper, 3935 (Herb. Edinb.). Bhutan, without precise locality, Griffith, 22, 37.

The confusion of *R. Dalhousiae* with *R. Lindleyi*, Moore, is dealt with at some length in the introductory notes to this paper (see p. 10). The differences between the two are numerous, and may be shown as follows:—

R. Dalhousiae, Hook f. (sensu stricto).	*R. Lindleyi*, T. Moore.
One-year-old *branchlets* bristly towards the apex.	One-year-old *branchlets* not bristly.
Leaves obovate, cuneate at the base, the scales below about their own diameter apart.	*Leaves* elliptic, rounded at the base, the scales below much more then their own diameter apart.
Pedicels softly hairy as well as scaly.	*Pedicels* only scaly.
Calyx lobes quite glabrous on the margins.	*Calyx* lobes densely fringed with soft white hairs.
Corolla about 9–12 cm. long, more or less gradually widened upwards.	*Corolla* about 7–8 cm. long, more or less saccate and abruptly widened about the middle.
Anthers about 1.3 cm. long.	*Anthers* 7–8 mm. long.
Style lepidote in its lower two-thirds.	*Style* lepidote only at the very base.
Capsule valves keeled.	*Capsule* valves not keeled.

12. **Rhododendron Lindleyi**, T. Moore in Gard. Chron. 1864, 364. *R. bhotanicum*, C. B. Clarke in Hook. f. Fl. Brit. Ind. iii. 475 (1882).

A woody parasitic climber growing upon various species of trees (Watt, n. 7004); older branchlets brown or greyish, spotted

with the remains of the scales; one-year-old branchlets rather sparingly lepidote, not setose; axillary leaf-buds very small, and still dormant at the time of flowering. *Leaves* elliptic or rather elongate-oblong-elliptic, rounded at both ends or occasionally a little cuneate at the base, rounded to a projecting or reflexed obtuse callous apex, 6–15 cm. long, 1.5–5.5 cm. broad, rather thinly coriaceous, glabrous dull and laxly reticulate above, glaucous beneath and rather laxly lepidote, the scales somewhat small and unequal and about 2–3 times their own diameter apart, the epidermis between the scales very closely papillous; midrib very slightly impressed on the upper surface, prominent below, about 2.5 mm. broad at the base, gradually tapered to the apex of the leaf, sparingly lepidote; lateral nerves 10–12 on each side of the midrib, diverging from it at an angle of about 45°, distinct above, prominent below and rather wavy, crenately looped near the margin; secondary nerves lax and subparallel; petioles 1.5–2 cm. long, not grooved above, rather sparingly lepidote. *Inflorescence* 4–6-flowered; scars of the fallen bud-scales very wide, straw-coloured; pedicels arising from slightly different levels, 1–1.5 cm. long, very densely covered with rust-coloured scales. *Calyx* about 1.5 cm. long, 5-lobed to near the base; lobes broadly oblong-elliptic, about 7 mm. broad, rounded at the apex, membranous, finely striate, glabrous outside except for a few scales at the base, rather densely fringed with soft white hairs. *Corolla* about 7–8 cm. long, widely tubular and rather suddenly broadened and slightly saccate in the middle; tube 5–6 cm. long, lepidote around the base only; lobes 5, rounded and emarginate. *Stamens* 10, about as long as the corolla tube; filaments rather densely villous in their lower third or nearly half; anthers 7–8 mm. long. *Ovary* 5-celled, nearly 1 cm. long, very densely covered with rusty scales; style curved, a little shorter than the corolla, lepidote only at the very base, crowned by a very large disk-like stigma. *Capsule* apparently straight, 5 cm. long, the valves finely lepidote, not keeled, somewhat membranous, surrounded at the base by the persistent calyx. *Seeds* not seen.

SIKKIM. 6000–8000 ft., 1848, fls., J. D. Hooker. Langhep, 9000 ft., 4th May 1876, fls., C. B. Clarke, 27762. Dikeeling, 8000 ft., 11th May 1876, fls., C. B. Clarke, 27876A. Darjeeling to Tongloo, in Magnolia forests of Lower Sikkim, 8000–9000 ft., 19th April 1881, flowers pale white, scented, G. Watt, 7004. On the way from Tongloo to Sandukfu, S. Sikkim, 10,000 ft., just past flowering, 11th May 1881, G. Watt, 5363. Tongloo to Sandukfu, 9500 ft., 29th May 1902, J. H. Lace, 2253. Darjeeling, towards Jalapahar, about 7500 ft., epiphytic, 13th April 1913, young flowers, C. Lacaita, 15667.

BHUTAN. Without definite locality, T. J. Booth.

MANIPUR. On 1st peak North East of Ching Sow, epiphytic on trees, forming a small bush, in bud 20th April 1882, G. Watt,

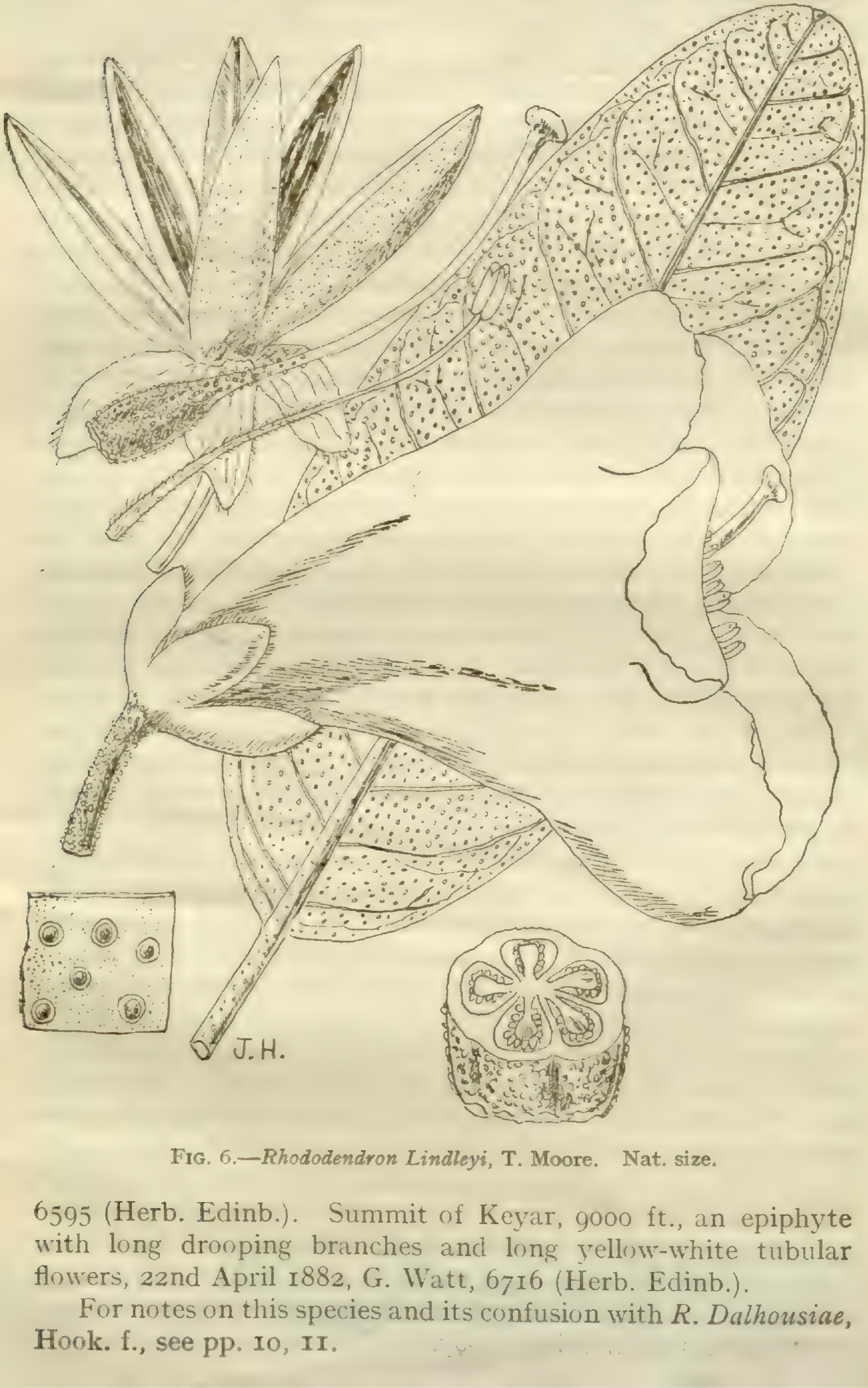

FIG. 6.—*Rhododendron Lindleyi*, T. Moore. Nat. size.

6595 (Herb. Edinb.). Summit of Keyar, 9000 ft., an epiphyte with long drooping branches and long yellow-white tubular flowers, 22nd April 1882, G. Watt, 6716 (Herb. Edinb.).

For notes on this species and its confusion with *R. Dalhousiae*, Hook. f., see pp. 10, 11.

13. **Rhododendron Nuttallii,** Booth in Kew Journ. Bot. v. 355 (1853); Hooker, Bot. Mag., t. 5146 (1859); Fl. des Serres, xiii. t. 1326-27 (1858); Illustr. Hortic. 1859, t. 208; C. B. Clarke, in Hook. f. Fl. Brit. Ind. iii. 470 (1882); Gard. Chron. xx. (1883), 49. Millais, Rhododendrons, 218, with photograph (1917).

A tree 10 m. high or a parasitic shrub about 4 m. high and then straggling with thick tuberous roots; one-year-old branchlets stout, 6–8 mm. thick, dark purplish-brown when dry, nearly glabrous; axillary leaf-buds very small and still dormant at the time of flowering: young branchlets with a few of the lower scale-leaves persistent, densely lepidote with scales which soon fall off. *Leaves* large, coarsely and strongly bullate-reticulate, elliptic, rounded at both ends, shortly and obtusely mucronate at the apex, 12–20 cm. long, 6–10 cm. broad, coriaceous, at first densely lepidote on the upper surface, soon becoming glabrous, densely lepidote below, the scales about 1½–2 times their own diameter apart, rather small, unequal in size and more or less rusty-brown when dry, the epidermis between the scales laxly papillous; midrib raised on the upper surface especially towards the base, very prominent below, sparingly lepidote, about 3–4 mm. broad at the base, gradually tapered to the apex; lateral nerves 12–16 on each side of the midrib, slightly elevated in a depression above, very prominent beneath, diverging from the midrib at an angle of about 45°, repeatedly looped and flexuous towards the margin; secondary nerves lax and distinct below; petioles about 2 cm. long, 3–4 mm. thick, compressed-terete, convex and not grooved on the upper side, rather sparingly lepidote when mature. *Inflorescence* about 5-flowered (sometimes up to 11-flowered, Hooker, l.c.), the pedicels arising from approximately the same level; flower-bearing buds very large, broadly ovoid, about 5 cm. long and 3.5 cm. through, the scales glaucous outside, very thick and leathery, and fringed in the upper part with soft short hairs, appressed silky villous towards the apex within; pedicels nodding, about 3 cm. long, reaching 4–5 cm. in fruit, lepidote, about 4 mm. thick. *Calyx* 1.5–2.5 cm. long, 5-lobed nearly to the base, the lobes chartaceous, oblong-elliptic, rounded at the apex, usually about 1 cm. broad, glabrous outside, sometimes with a few short weak hairs on the margin. *Corolla* 10 cm. long or more, widely campanulate in the upper part, with a limb about 15 cm. across, 5-lobed, white suffused with yellow within the tube, the lobes slightly tinged pink; tube lepidote mainly towards the base outside; lobes scarcely lepidote, rounded. *Stamens* 10, crowded together in the middle of the flower, about as long as the corolla tube; filaments

pubescent towards the base ; anthers about 1 cm. long, reddish-brown. *Ovary* 5-celled, nearly 1 cm. long, densely lepidote only towards the base, curved towards the top, nearly as long as the corolla, crowned by a very large depressed stigma about 8 mm. in diameter. *Capsule* straight, 3–3.5 cm. long, the valves faintly keeled on the back, lepidote. *Seeds* 3 mm. long, broadly winged, light straw-coloured.

BHUTAN. Duphla Hills at Meré Patar about Seram's village, on the banks of the Papoo, swampy ground amongst Yews and Oaks at 4000–5000 ft., T. J. Booth.

I have seen no other dried wild specimens than the original ones collected by Booth, of which there are four sheets at Kew, and upon which the above new description is based.

This beautiful species needs no recommendation as a greenhouse plant ; it is perhaps the finest of the lepidote-leaved Rhododendrons. Sir William Hooker (Bot. Mag. l.c.) described it as the "Prince of Rhododendrons," and continues, "It flowered in the Rhododendron House at Kew in May of the present year [1859], and of which a drawing of the flowering portion, on imperial folio, is now before us. The height was nine feet. The principal branch was terminated by a corymb of ten or twelve flowers, the cluster measuring fifteen inches across ; the corollas white, yellow in the centre, having measured six inches across, with a tinge of blush on the lobes ; and the bud, just before expansion, is of the same length. The leaves have their charms too ; the largest of them a foot long, including the short thick petiole, are much puckered on the superior surface, that is swollen or blistered in the areoles of the network, and these reflect a strong light. Nor does this include all the beauties of the plant. The corymb, long before it is developed, is enclosed within a scaly bud, if I may call it, six inches long and nearly four inches in diameter, very much resembling a pine-cone or the flower-head of some South African Proteaceous plant ; and the large deciduous scales are richly coloured too, almost white below, deep rose in the centre, and tipped with green. Somewhat similar but smaller scale-buds envelop the infant foliage, which, too, is red when it first bursts forth. Such a Rhododendron well merits the name of the late Mr Nuttall, given to it by its discoverer, Mr Booth ; and we know that but a little before his lamented death, one of the last sources of pleasure he derived from the vegetable creation, which he had so long and so successfully studied, was the information of his namesake having for the first time flowered (at Kew), and the sight of the large drawing above referred to."

Mr Millais tells us that *R. Nuttallii* is seldom grown out of doors even in Cornwall ; there it is sometimes planted against

walls, and there are good specimens at Tregye, Bosaham, Tremough, and Scorrier. In mid-winter, like nearly all Himalayan Rhododendrons, it withstands rather severe cold, but the young shoots which appear early in spring are readily nipped by late frosts.

There are at least two fine hybrids: *R. Victorianum*, between *R. Nuttallii* and *R. Dalhousiae*; and *R. edinense*, a cross between *R. Nuttallii* and *R. Henryanum*, the latter a hybrid of *R. Dalhousiae* and *R. formosum*.

Some interesting crosses will no doubt be possible in the future from *R. Nuttallii* and its nearer relations as shown in the present paper, especially the Chinese species, *R. excellens*, *R. liliiflorum*, and *R. megacalyx* (Burma).

14. **Rhododendron ciliatum,** Hook. f., Rhod. Sikkim Himal. t. 24 (1851); Hook. f. in Journ. Hort. Soc. Lond. vii. 77, 95 (1852); Hook. Bot. Mag., t. 4648 (var. roseo-album) (1852); Lindl. & Paxt. Fl. Gard. t. 83 (1852–3); Lemaire, Jard. Fleur. iii. t. 312 (1853); Fl. des Serres, viii. t. 766 (1852–3); Regel, Gartenfl. t. 563 (1867); Millais, Rhododendrons, p. 144 (1917).

A shrub 0.6–1.3 m. high, often procumbent on rocks (Clarke); older branches becoming smooth by the bark peeling off; one-year-old branchlets setose with long slender hairs and finely lepidote; axillary leaf-buds still more or less dormant at the time of flowering; young branchlets clothed for some time with the subpersistent bud-scales. *Leaves* elliptic or oblong-elliptic, rounded at the base, with a triangular obtusely mucronate apex, 4–9 cm. long, 1.5–4 cm. broad, firmly coriaceous, setose with long rather weak hairs above especially when young, becoming glabrescent with age and slightly bullately reticulate, green and fairly laxly lepidote below, with a few setae only on the midrib, the scales small and about 2–3 times their own diameter apart (*i.e.* about one in the middle of each mesh of the network of veins), the epidermis somewhat pustulate between the scales; midrib somewhat setose on both surfaces, prominent below; lateral nerves about 10 on each side of the midrib, diverging from it at an angle of about 45°, slender but distinct below; petioles 5–7 mm. long, setose with long hairs. *Inflorescence* 2–4-flowered, very shortly racemose; bud-scales apiculate, fringed with soft white hairs, only the outermost with a few scales on the back; pedicels about 1 cm. long, elongating to 2 cm. in fruit, densely setose and finely lepidote. *Calyx* well developed, 5-lobed to near the base, 8–10 mm. long, lobes broadly ovate-rounded, nervose, densely fringed with long stiff hairs, sparingly lepidote outside towards the base. *Corolla* nodding, about 4 cm.

long, white slightly tinged with rose fading deeper rose * ; tube rather broadly funnel-shaped, about 2 cm. long, glabrous outside ; lobes 5, emarginate, shorter than the corolla, glabrous. *Stamens* 10, about as long as the corolla tube ; filaments densely pubescent towards the base ; anthers 3–4 mm. long, chocolate-brown. *Ovary* 5-celled, closely scaly, the cells with copious " shoulders " at the apex ; style curved, about as long as the corolla, quite smooth, crowned by the disk-like lobulate stigma. *Capsule* 1.5 cm. long, surrounded by the persistent calyx, the valves very obtusely acuminate. *Seeds* linear, with the testa crested at one end.

SIKKIM. Lachen, in swamps, 9000 ft., past flower 2nd June 1849, J. D. Hooker (type). Lachen, 10,000 ft., fls. May 1885, Pantling in Herb. Clarke, 46449A. Laghep, 11,000 ft., 5th May 1876, procumbent on a rock, corolla white with rose flushes, C. B. Clarke, 27785A. Yeumthang, 11,000 ft., 15th June 1915, fls. white, G. H. Cave (Herb. Edinb.). Without definite locality, fr., G. H. Cave, 6737 (Herb. Edinb.).

In the Fl. Brit. Ind., l.c., Mr Clarke records it from Chola and Dikchoo, Sikkim.

As there seems to have been some mis-interpretation regarding the colour of the flowers (explained in the footnote below) through Hooker f. having drawn them in a faded condition, I give below a transcript of Hooker senior's notes accompanying his var. *roseo-album* in the Botanical Magazine, t. 4648 (1852) :—

" It is scarcely two years since the seeds of this *Rhododendron* were received from Dr Hooker, and already (March 7, 1852) six plants of it have produced flowers while only seven inches high, and many others are showing blossoms. Their flowering has given us peculiar pleasure, as the first of the Sikkim-Himalayan Rhododendrons which have done so ; and on another account. From more than one quarter hints have been thrown out that the author of the work above cited has used some freedom in going beyond nature in the size and colouring of the flowers. Such gratuitous statements, from very incompetent judges, are contradicted by the first species that has blossomed ; for assuredly our cultivated *R. ciliatum* far excels in size of the corolla, and delicacy of tint, Dr Hooker's original figure. Even were the reverse the case, it would be no proof of any inaccuracy in Dr Hooker's figures, for no intelligent traveller in Sikkim can fail to observe how liable the flowers of all the species of Rhododendron are to vary in size and colour (nor are the leaves more

* Hooker figures the flowers as dull violet, but Clarke (l.c.) remarks : " The wild plant has the flowers white, slightly tinged with rose, fading a deeper rose. Sir J. D. Hooker sketched his species in Sikkim (Rhod. Sikkim, t. 24) from a plant ' past flower,' hence with too purple a corolla."

constant) : in the present instance the difference is so great, though there cannot be a question of the identity of species, that we feel ourselves, as it were, compelled to make it a *variety*. The corollas are nearly, if not quite, double the size of the native plant as seen by Dr Hooker, and instead of being of a uniform lilac-purple colour, they are of the most delicate white, tinged with red-rose colour. In all other respects the two plants perfectly agree. It is a native of wet rocky places (rarely in woods) of Sikkim-Himalaya, in the Lachen and Lachoong valleys; elevation 9–10,000 feet. It may be expected to be hardy therefore; and, indeed, we may observe, that young plants of nearly all our species from Sikkim-Himalaya have passed this winter in the open air, simply surrounded by a bank of earth a foot and a half high. *R. Dalhousiae* alone has failed in such a situation, and in many cases we know that it has equally failed under glass. *R. ciliatum* has been kept in a cool greenhouse, and has certainly the merit of being a ready flowerer, and that at a very early age."

Professor Balfour gives some interesting notes on the colour of the flowers of this species under various cultural conditions in his notes at the end of the description of *R. Valentinanum* (p. 48).

Mr Millais, in his book on Rhododendrons, l.c., gives an interesting account of this species in cultivation, to which the reader may be referred for fuller details. He states that in Cornwall and the West of Scotland it grows as much as 9 ft. high and 16 ft. through. The species proves to be more hardy than most of the others from the Himalayas, and in gardens there is apparently considerable range in the colour of the flowers. Mr Millais describes them as "rich red in bud and opening to pale pink, pale reddish-purple or white, all fading to white after a few days." He speaks very highly of this species as a garden plant, and gives what is known of its use in hybridisation.

The following remarkable species, closely resembling *R. ciliatum*, has turned up since this paper was completed. Professor Balfour very kindly allows the description to appear here :—

3799 15. **Rhododendron Valentinianum,*** G. Forrest.†

A small shrub attaining a height of about 1 m., freely branched and bearing rosettes of 4–5 small leaves at the ends

* Named after Père S. P. Valentin of the Tsedjong Mission, to whom I am indebted for much assistance during my explorations. G. Forrest.

† *Rhododendron Valentinianum*, G. Forrest.—Species nova Sectionis Maddeni Rhododendro ciliato, Hook. f. arcte affinis.

Frutex ad 1 m. altus, foliis ad apicem ramulorum strigillosorum et lepidotorum

of the branches, the last-formed leaf or two leaves markedly smaller than the others, falling off with the flush of the following year. Young twigs about 2 mm. in diameter densely setose, the long setae covering the lepidote surface beneath, which has peltate scales with wide umbo and equal fringe, setae and scales disappearing more or less in second year; older branches at first dark grey then decorticating and exposing a red-purple smooth surface. Foliage-leaf bud nestling in centre of leaf-rosette, the last leaf of rosette smaller than others with its broader petiole adpressed to the bud; outer scales-leaves oblong broadly triangular and rounded, lepidote outside and puberulous, setulosely ciliate, mucronulate and slightly keeled, persisting on the branches for one or two years, inner spathulate, obtuse, membranous, as much as 2 cm. long, 8 mm. broad, lepidote and puberulous outside, ciliate, carried up on the elongating shoot; young expanding leaves conduplicate convolute, densely lepidote on both surfaces, setulose on upper surface and on margin. Leaves petiolate, as much as 4.5 cm. long; lamina thickly coriaceous, elliptic or oblong-elliptic, as much as 4 cm. long, 2 cm. broad, rounded at the shortly mucronulate tuberculate apex, margin setulose-ciliate, base obtuse or rounded; upper surface mat pale green; midrib grooved, primary veins about 8 on each side, hardly visible, whole surface including midrib more or less setulose and punctulate with withered peltate scales or marked with traces of the juvenile setae and scales; under surface somewhat tawny brown with prominent midrib and hardly visible primary veins, densely lepidote with partly contiguous partly discontiguous peltate scales never more distant than the diameter of the scales, the midrib lepidote without bristles or with a few at the base, scales somewhat unequal in size a few scattered ones much larger than others, each with a very broad umbo and very narrow entire fringe all infiltrated with orange or reddish secretion, intervals between scales green grey beset with rod-like epidermal papillae; petiole

rosulatim confertis; alabastrorum perulae persistentes, vernatione conduplicato-convoluta. Folia coriacea, elliptica vel oblongo-elliptica, ad 4.5 cm. longa, 2 cm. lata; lamina apice rotundata, mucronulata, margine setoso-ciliata, basi obtusa vel rotundata, supra setulosa et lepidota vel vestigiis setularum et squamarum induta, infra dense lepidota, epilosa; petiolus ad 1 cm. longus. *Flores* in umbellas terminales 2–6-floras aggregati; bracteae per anthesin persistentes; bracteolae calyce longiores; pedicelli setosi et lepidoti. *Calyx* foliaceus fere ad basim 5-lobatus; lobis membranaceis extus lepidotis margine setoso-lanato-ciliatis. *Corolla* laete flava, ad 3.5 cm. longa, infundibuliformi-campanulata, extus intusque puberula, extus ubique lepidota squamis scintillantibus; lobis rotundatis circ. 1.3 cm. longis saepe squamoso-ciliatis. *Stamina* 10, inaequalia, corolla breviora; filamentis complanatis a basi villosis. Discus dense puberulus. *Gynaeceum* staminibus longius corolla brevius; ovarium circ. 3 mm. longum dense lepidotum squamulis succulentis; stylus basi lepidotus apice sub stigmate lobulato clavatus.

as much as 1 cm. long, usually shorter, setose and lepidote like the young stems. Inflorescence a 2--6-flowered terminal umbel; bracts persisting during flowering, outer reddish, broad, rounded, glabrous outside, inside puberulous and whitely sericeous near the top, margin particularly over the summit fringed with dense short white stiff straight hairs, inner fertile bracts broadly spathulate the lower half grasping the flower-pedicel about 1.5 cm. long, 1 cm. broad, chartaceous, the back finely puberulous the margin whitely ciliate as in the outer ones; bracteoles persisting during flowering as much as 1.3 cm. long slightly exceeding the calyx, linear-spathulate, densely pilose throughout on back and hair-crested with simple white stiff hairs and some twisting long setae, usually elepidote, occasionally one or two scales; pedicels at most 5 mm. long, setulose with twisting setae and also lepidote like the stems. *Calyx* leafy, about 8 mm. long, cut to the base into 5 membranous lobes; cup very densely lepidote with fleshy scales; lobes oblong, acute or obtuse, lepidote on back, glabrous inside, densely lanately setulose at margin, flabellate-veined. *Corolla* bright yellow, funnel-campanulate, about 3.5 cm. long, 5-lobed, puberulous with long hairs both outside and inside the entire portion, lepidote all over the outside, the scales glistening fleshy yellow or red; lobes rounded, about 1.3 cm. long and broad, spreading, slightly crenulate and more or less scale-fringed. *Stamens* 10, unequal, shorter than corolla, longest about 2.8 cm. long with anther 3 mm. long, shortest about 1.8 cm. long with anther 2.5 mm. long; filaments band-like, flattened from the base, white villous over one half in shorter, one third in longer stamens; anthers oblong, pink. Disk densely white puberulous. *Gynaeceum* about 3.2 cm. long, shorter than corolla, longer than stamens; ovary conoid truncate about 3 mm. long, densely lepidote with larger red and smaller yellow fleshy scales; style lepidote at the base, glabrous above expanding at tip into a lip around the lobulate discoid broad stigma. *Capsule* ovoid (? mature), lepidote outside, enclosed by the calyx.

"YUNNAN. Shweli-Salween divide. Lat. 25° 20′ N. Alt. 11,000 ft. In open scrub. Shrub of 2½–3 ft. Flowers bright yellow. G. Forrest. No. 15899; May–June 1917. In fruit. No. 16011; Nov. 1917.

"A distinct species and best described as a yellow-flowered *Rh. ciliatum*, Hook. f. Not that it is *Rh. ciliatum* in every respect save in flower colour. It shows many other differences. The readiest of recognition are these—the leaves are not setulose over the under-surface as in *Rh. ciliatum* and the corolla is lepidote and pilose not elepidote and epilose. *Rh. ciliatum* is without doubt the nearest ally of *Rh. Valentinianum*, and in habit the

plants are very much alike. *Rh. ciliatum* is an old-established garden plant and *Rh. Valentinianum* is now also in cultivation raised by Mr J. C. Williams at Caerhays from seed of Forrest's collecting. It has not yet flowered. We have promise therefore of a pair of beautiful horticultural plants representing one the Himalayan, the other the West Chinese, evolution of the same phylum. Coming from an elevation of 11,000 ft. near Tengyueh, *Rh. Valentinianum* should like *Rh. ciliatum* be a thoroughly hardy plant if grown under right conditions. And saying this leads me to add that *Rh. ciliatum* is commonly regarded as one of the not altogether hardy of the Himalayan species or at any rate is supposed to require a sheltered spot in the garden. That is not our experience in Edinburgh. Certainly if planted out of the wind and where it gets a moderate amount of sunshine it forms a larger bush than in more exposed situations, but it is then cut back more or less every year and soon becomes a sorry spectacle. Here our greatest success with it is in positions the opposite of sheltered. We plant it high up on the rock garden to fill a shallow col between two mounds. There it gets every ray of sunshine available, drops of all the rain that falls, a blow from every wind whether a gentle zephyr or a gusty gale. It forms a dense carpet about a foot high closely leafed to the soil all around the margins so that no wind blows through amongst the stems of the mass—this I think most important—and is covered in spring with large flowers tinted most of them from their opening a deep rose and in a degree such as to lead one to believe that the colour given by Hooker in his Sikkim Rhododendrons if perhaps 'too purple' as Clarke * says may be near the predominant shade at higher elevations. In sheltered situations here the flowers are usually white tinged with rose as descriptions give it; in the greenhouse pure white—all of which modification in tint is consonant with the function of the anthocyanin in the corolla acting as a heat regulator as it does elsewhere in this genus and in other genera. In this exposed situation on our rock garden the plant is not cut back. There is no dying back of shoots making gaps in the uniform carpet. Our experience with this *Rh. ciliatum* is repeated in the case of many another evergreen undershrub from high altitudes—very markedly in the case of New Zealand whipcord Veronicas which in the ordinary mixed garden border have their symmetry spoiled by the dying back of individual shoots, but exposed to every wind that blows and in full sunshine do not or rarely exhibit this defect. Thinking of an explanation of the phenomenon described, I suggest that it is the wind-currents which make the difference. Water does not lie on the

* Hook. f. Fl. Brit. Ind. iii (1882), 470.

leaves and twigs and consequently respiration is not interfered with, and along with this as a factor in the case is the harder growth of the plant which the situation evokes. This is not to be taken as an infallible prescription for horticultural practice, but our experience confirms me in believing that within the limits of the constitution of the plant rigorous environment, rather than genial, will give better results in the case of many of those plants which in our oscillating climatic conditions show themselves not quite hardy.

"*Rh. Valentinianum* like *Rh. ciliatum* is one of many species of *Rhododendron* which were placed by Maximowicz * in his Section Eurhododendron, but which have such fundamental characters of difference from other species of his Section that they cannot be associated together in one section. The bulk of the species known to Maximowicz and included in his Eurhododendron possess a foliage-bud of remarkable construction which may be called a chamber-bud. By this designation I mean that the scale-leaves of the bud form a definite chamber at the bottom of which the primordia of the foliage-leaves arise each developing with a revolute ptyxis quite free from its neighbour. The young leaves stand erect in a group free within the chamber and only fill it up when the bud is on the way to maturity before expansion. There is a sharp distinction between the last scale-leaf and the first foliage-leaf. This type of bud is found in most of the series of Rhododendrons with large leaves—for example in those of *arboreum, barbatum, Edgeworthii, Falconeri, Fortunei, heliolepis, irroratum, lacteum, ponticum, Thomsoni*. In contrast with this type of bud is that in which there is no chamber. The scale-leaves overlap with vernation that becomes convolute and the young foliage-leaves continue the ptyxis and vernation of the scale-leaves and the more external are convolutely wrapped round the inner ones in a normal succession. Often the delimitation of the last scale-leaf from the first foliage-leaf is not easy to determine. This is the type of bud that is found in most of the small-leaved Rhododendrons—for instance the Lapponicum, Fragrans, Cephalanthum Series; in Rhododendrons with intermediate size of leaf—for instance the Triflorum Series; and in larger-leaved forms—for instance Maddeni, Boothii, Camelliaeflorum Series. *Rh. Valentinianum* belongs in leaf-scale to the Maddeni Series and has thus its characteristic convolute type of bud. I cannot discuss here the grouping of the species of Rhododendron. I hope to deal with that question later in these pages. But I want to point out that this difference in bud-construction is primary and must be taken into account in any scheme of

* Maximowicz, *Rhododendreae Asiae orientalis* (1870).

subdivision of the genus. Species with revolute ptyxis must belong to a different division from those with convolute. So far as I know it has not hitherto been recognised, at any rate no importance has been attached to it. And perhaps one reason for its being overlooked may be found in an incident of the development. In many species with convolute leaves in bud the young leaves as they unfold from the bud at once become recurved at the sides. The change may be interpreted as providing protection to the underleaf surface. Its effect is that the leaves are revolute when they open, but this is a secondary not a primary position and is brought about in a very different way and at a different period in development. Casual observation of the leaves at expansion would not supply evidence for deciding whether a revoluteness is primary or secondary and misinterpretation may have resulted. *Rh. Dalhousiae* of the Maddeni Series shows this passage from convolute to revolute very clearly. In the Triflorum Series *Rh. chartophyllum* does not show it nor does *Rh. Davidsonianum*, but many plants the identity of which is not yet clear and which have been called *Rh. Davidsonianum* show it.

"The Maddeni Series to which *Rh. Valentinianum* belongs is a natural one. It has a wide area of distribution from Sikkim in the west through Bhutan, Siam, Burma, right across Yunnan to Mengtz in the extreme south-east of the province and in Kweichow. We may safely say that other species of it yet await discovery. Those we know of show interesting divergences within the phylum and through minor characters of relation fall into subordinate groups within the series. *Rh. ciliatum* and *Rh. Valentinianum* make one such group—a Sikkim-Bhutan form on the west and a Yunnan form on the east, doubtless to be hereafter connected by the finding of linking forms in the intermediate region. *Rh. Dalhousiae* is a western type to which *Rh. rhabdotum*, Balf. f. et Cooper and other forms belong; *Rh. Maddeni* itself is a western form with several microforms; in the middle area of distribution *Rh. formosum* with *Rh. Veitchianum* represent a differential form; and on the eastern area of distribution there are two prominent types centering one in *Rh. ciliicalyx* and the other in *Rh. crassum*. Notwithstanding divergences all the species conform to one prominent type of bud—the nest-bud it may be called because of the disposition of the surrounding leaves to the terminal bud. The last formed foliage-leaves of the shoot lying close up to and around the terminal bud are much reduced in size, have a broad somewhat vaginate petiole adpressed to the bud and the shoot, and the lamina stands off at nearly right angles from the petiole. They are of a

form as it were intermediate between foliage-leaves and scale-leaves. The bud—vegetative as well as flower—lies embosomed in these which do not belong to the axis-segment of the bud, are not bud-scale leaves, but the last formed of the preceding foliage-shoot and have buds in their axils."

16. **Rhododendron Cuffeanum,** Craib ex Hutchinson in Bot. Mag. t. 8721 (1917).

A loosely branched shrub ; stem swollen at the base ; young shoots pale grey, covered with brown peltate scales ; older branchlets pale brown, closely marked with the traces of fallen scales. *Leaves* few, oblanceolate or oblong-oblanceolate, gradually and shortly acuminate to an obtuse tip, gradually narrowed to the base, up to 10 cm. long and 3 cm. broad, coriaceous, at first lepidote above, soon becoming glabrescent and conspicuously reticulate, rather densely lepidote below, the scales unequal and about their own or slightly less than their own diameter apart, the epidermis densely papillous between the scales ; midrib impressed above, slightly raised beneath ; lateral nerves 6–7 on each side of the midrib, slender, flexuous, slightly raised on each surface ; petiole 1.2 cm. long, lepidote, grooved above. *Inflorescence* about 5-flowered, the pedicels arising from approximately the same level ; pedicels 1–1.5 cm. long, densely lepidote, about 1.5 mm. thick. *Calyx* foliaceous, nearly 1 cm. long, unequally 5-lobed, the 2 abaxial lobes larger than the others, oblong or oblong-rounded, rounded at the apex, lepidote, fringed with a few weak hairs. *Corolla* tubular-campanulate, 6.5 cm. long, white, with a large yellow blotch within the upper side of the tube ; tube 3.5 cm. long, softly pubescent outside towards the base, not lepidote except towards the 5 lobes which are sparingly so towards the middle. *Stamens* 10, exserted, unequal, the shortest a little longer than the corolla tube ; filaments softly villous-pubescent in their lower half ; anthers brown, 6 mm. long. *Ovary* 6-celled, about 1 cm. long, densely lepidote; style longer than the corolla, sparingly lepidote towards the base, crowned by a capitate dark brown stigma. *Capsule* not seen.

SOUTH-WEST BURMA. Mt. Victoria, Lady Wheeler Cuffe.

Young plants of this species were collected on Mt. Victoria by Lady Wheeler Cuffe and presented to the Royal Botanic Gardens, Glasnevin, in August 1913. From one of these, which flowered in May 1915, was obtained the material on which the above description is based, and which was figured in the Botanical Magazine.

Owing to some mischance it was stated in the Botanical Magazine that this species was gathered on Sindaung Mountain in the Southern Shan States, but Sir Frederick Moore wrote later informing the Director, on Lady Wheeler Cuffe's authority, that it was from Mt. Victoria in S.W. Burma.

17. **Rhododendron ciliicalyx,** Franch. in Bull. Soc. Bot. France, xxxiii. 233 (1886); Le Jardin, ix. 51 (1895); Rev. Horticol. 1899, 36; Hook. f. Bot. Mag. t. 7782 (1901).

A shrub up to 1 m. high (up to 3 m. in cultivation); older branchlets with loose grey smooth bark; one-year-old branchlets pale yellow when dry, rather loosely covered with small scales, sometimes sparingly strigose amongst the scars of the bud-scales; axillary leaf-buds just elongating at the time of flowering, the scales broadly ovate, subacute, leathery, slightly lepidote on the back, fringed within the margin with a conspicuous beard of dense soft white hairs. *Leaves* elliptic, obovate-elliptic or oblong-lanceolate, rather acutely pointed, slightly narrowed or rounded to an obtuse base, 6–9 cm. long, 2–3.5 cm. broad, rigidly coriaceous, conspicuously reticulate and glabrous (at first lepidote) above, glaucous-grey beneath and lepidote, the scales golden-brown and considerably more than their own diameter apart, in the wild examples the epidermis rather densely covered between the scales with short rod-like papillae (see note at end of description); petioles 1.3–1.5 cm. long, punctate with small scales, with a narrow groove on the upper side, with a few long bristles on the edges especially when young. *Inflorescence* about 3-flowered, the pedicels arising from about the same level; scars of the fallen bud-scales fairly dense, transversely linear, straw-coloured; pedicels 1–1.5 cm. long, about 2 mm. thick, rather densely lepidote with small scales especially just below the calyx. *Calyx* rather variable in size, 5-lobed to near the base; lobes 2.5–6 mm. long, 3–4 mm. broad, submembranous, laxly scaly outside, bristly all round the margins with slender hairs about 3 mm. long. *Corolla* white or rose (Delavay), rather widely funnel-shaped, gradually opening from the base upwards; tube a little shorter than the lobes, 2.5–3 cm. long, about 5 mm. in diameter at the base, 3–4 cm. wide at the top when flattened out, not scaly outside but slightly and shortly pubescent towards the base; lobes 5, ovate-orbicular, about 3.5 cm. long, and broad, sometimes with a few golden scales on the back. *Stamens* 10–11, unequal in length, the longest nearly as long as the corolla; filaments rather long-pilose in their lower third; anthers 4 mm. long.

Ovary 6-celled, 5 mm. long, densely lepidote; style about as long as the stamens, scaly and slightly pilose only as far as 8 mm. above the base, the upper part glabrous, crowned with a green discoid stigma. *Capsule* 6-valved, 2 cm. long, about 1.5 cm. thick, rather asymmetrical at the base, densely scaly, girt at the base by the persistent calyx and the conspicuous tomentose disk.

As *Rhododendron ciliicalyx* is likely to prove of considerable interest to physiologists (see note below), it seems advisable to give the salient features of the *type* specimen, collected by Delavay, 736, on Mt. Pee-cha-ho, near Mo-so-yn, Yunnan. These are as follows:—

One-year-old branchlets scaly, sometimes sparingly strigose amongst the scars of the bud-scales. *Petioles* scaly, long-setose on the margin (these setae readily rub off). *Leaf-scales* below unequal-sized, *considerably more* than their own diameter apart. *Pedicels* densely scaly. *Calyx lobes* well developed but variable in size, oblong to oblong-ovate, rounded at the apex, 2.5–6 mm. long in the same flower, in other flowers as small as 2–3 mm. long, sparingly scaly outside, rather densely fringed with hairs about 3 mm. long. *Corolla* sparingly lepidote only on the back of the lobes, the tube softly pubescent towards the base. *Style* pubescent and sparingly scaly only towards the base.

W. YUNNAN. On the sides of rocky hills at the entrance to the gorges of Mt. Pee-cha-ho, near Mo-so-yn, 7300 ft., shrub about 3 ft. high, flowers rose or white, 27th March 1887, Delavay, 736 (type); same locality, in fruit, 16th November 1887, Delavay; in flower, 17th April 1888, Delavay.

R. ciliicalyx has not appeared among any recent collection that I have seen, and it has probably not been gathered since the date of the specimens quoted above. In the plants of this species grown in the Himalayan and Temperate Houses at Kew I was very surprised to find that the papillae, so characteristic of the whole of the *Maddeni* series, have almost entirely disappeared. Only occasionally in leaves near the glass and exposed to good light do the epidermal cells of the lower leaf surface show a trace of papillous differentiation, and then only of the slightest. The same is evident of a plant grown in an unheated greenhouse by Mr J. C. Williams, Caerhays Castle, Cornwall, who very kindly forwarded a twig for examination. On the other hand, the specimens cultivated in the greenhouses at the Edinburgh Botanic Garden have papillous leaves. I hope to publish a separate note on this later.

18. **Rhododendron pseudociliicalyx,** Hutchinson, n. sp.*

One-year-old shoots about 4 mm. thick, rather densely bristly with hairs in the upper part, becoming less bristly below, rather minutely lepidote ; bark dull brown ; axillary leaf-bearing buds still dormant or just starting to elongate at the time of flowering, the scale-leaves leathery, lepidote outside, fringed with soft white hairs. *Leaves* elliptic or elliptic-lanceolate, widest at the middle, equally narrowed to both ends, with an obtuse callous mucro at the apex, 6–8 cm. long, 2.5–3 cm. broad, thinly leathery, laxly and faintly reticulate above and with a few scales persisting here and there, glaucous-green below and rather densely covered with very unequal-sized pale orange-yellow scales below, the scales less than their own diameter apart, with very narrow fringe ; epidermis rather laxly covered with rod-like papillae ; midrib slightly impressed above, prominent below, covered with a few scales ; lateral nerves about 6 on each side of the midrib, rather faint on both surfaces, looped some distance from the margin ; petiole 0.5–1 cm. long, grooved above, densely lepidote, ciliate with long weak hairs. *Inflorescence* 3–4-flowered ; pedicels arising from different levels, about 8 mm. long, densely lepidote with light-coloured scales. *Calyx* saucer-shaped, undulately lobed, 2 mm. long, lepidote outside, the tops of the lobes sometimes with a few (1 or 2) long hairs. *Corolla* about 6.5 cm. long ; tube 4 cm. long, very slightly pubescent outside the base, sometimes with one or two scales here and there ; lobes 5, broadly oblong-rounded, lepidote outside and on the finely undulate margin. *Stamens* 10, unequal, exserted ; filaments pubescent in the lower part ; anthers 4 mm. long. *Ovary* 5-celled, 5 mm. long, densely lepidote ; style nearly as long as the corolla, lepidote in the lower half,

* *Rhododendron pseudociliicalyx*, Hutchinson, sp. nov. ; affinis *R. ciliicalyci*, Franch., sed ramulis dense setosis foliorum squamis valde inaequalibus densioribus differt.

Ramuli annotini circiter 4 mm. crassi, superne dense setosi, inferne subglabrescentes, minute lepidoti, cortice fusco-brunnei ; gemmae foliiferae axillares sub anthesin vix evolutae. *Folia* elliptica vel elliptico-lanceolata, medio latiora, utrinque aequaliter angustata, apice obtuse mucronata, 6–8 cm. longa, 2.5–3 cm. lata, tenuiter coriacea, supra laxe reticulata, infra glauco-viridia, dense lepidota, squamis valde inaequalibus pallide aurantiacis fere contiguis, epidermide laxe papillosa ; costa supra leviter impressa, infra prominens, laxe lepidota ; nervi laterales utrinsecus circiter 6, inconspicui, petioli 0.5–1 cm. longi, supra canaliculati, dense lepidoti, pilis debilibus ciliati. *Inflorescentia* 3–4-flora ; pedicelli subracemosi, circiter 8 mm. longi, dense lepidoti. *Calyx* patelliformis, undulate lobatus, 2 mm. longus, extra lepidotus, interdum parce ciliatus. *Corolla* circiter 6.5 cm. longa ; tubus 4 cm. longus, extra basin leviter pubescens ; lobi 5, late oblongo-rotundati, extra lepidoti. *Stamina* 10, inaequalia, exserta ; filamenta inferne pubescentia ; antherae 4 mm. longae. *Ovarium* 5-loculare, 5 mm. longum, dense lepidotum ; stylus corollae fere aequilongus, in dimidio inferiore lepidotus, stigmate profunde lobulato coronatus.

crowned by a fairly large deeply lobulate stigma. *Capsule* not known.

Described from a specimen in the Edinburgh Herbarium inscribed as follows: "Rhododendron spec.? No. 7167. Mᵒᵉ L. de Vilmorin. Chine. Cult. Verrières, France, serre, 19.4.18."

Unfortunately we have no definite information as to the habitat of this species. Professor Balfour says in regard to it: "Raised from seed received in 1912 from China by M. Philip de Vilmorin. Most of de Vilmorin's seeds came from N.E. Szechwan." If this species came from this province, it will be a valuable addition to our gardens, as it would no doubt be fairly hardy, and is, moreover, almost a replica of the beautiful but somewhat tender *R. ciliicalyx* from Western Yunnan. It differs from *R. ciliicalyx* in its very bristly shoots and the denser leaf-scales.

19. **Rhododendron missionarum,** Léveillé in Bull. Geogr. Bot. xxiv. 20 (1915).

A shrub with short knotty branches, the older parts covered with grey transversely splitting bark; one-year-old branchlets very short, very slightly lepidote, strigose-pilose. *Leaves* obovate-oblanceolate, narrowed to the base, apex triangular-apiculate with a rather long callous mucro, 5–7 cm. long, 1.5–3 cm. broad, rigidly coriaceous, lepidote above when young, soon becoming nearly glabrous and slightly reticulate, glaucous and lepidote below, the scales slightly unequal and less than their own diameter apart, the epidermis densely papillous between the scales; midrib and lateral nerves impressed above, the former prominent and lepidote below; lateral nerves about 8 on each side of the midrib, arcuate and ascending; petiole 6–10 mm. long, grooved above, lepidote. *Inflorescence* 2–3-flowered; floral bud-scales softly appressed-villous in the upper part; pedicels 6–10 mm. long, arising from about the same level, densely lepidote with flake-like scales. *Calyx* about 1 mm. long, obscurely 5-lobed, densely lepidote outside and fringed with stiff hairs about 1 mm. long. *Corolla* violet or white (Maire), 5 cm. long, not lepidote outside or rarely with one or two scales here and there; tube funnel-shaped, 2.5 cm. long, minutely pubescent towards the base outside; lobes 5, 2.5 cm. long and nearly as much broad, undulate on the margin and sometimes fringed with a few scales. *Stamens* 10, exserted; filaments villous pubescent in the lower third; anthers 6 mm. long. *Ovary* 5-celled, 5 mm. long, lepidote; style curved, a little longer than the corolla, lepidote in the lower half or

two-thirds, crowned by a large lobulate stigma. *Capsule* 1.2 cm. long, wrinkled and lepidote.

N.E. YUNNAN. Tong-Koua-pin, 9000 ft., on rocks, fls. April 1911, E. E. Maire; E. E. Maire, 20, 21 (Herb. Edinb.). Motsou region of Kiao Kia, plant collected by Père S. Ten, March 1909, F. Ducloux, 1270, 1271.

20. **Rhododendron Lyi,** Léveillé, in Fedde, Repert. xiii. 147 (1914).

A shrub 1.75–2 m. high; one-year-old branchlets slender, about 2.5 mm. thick, sparingly lepidote and bristly with rather

FIG. 7.—*Rhododendron Lyi*, Léveillé. **Nat. size.**

weak long hairs. *Leaves* oblanceolate or oblong-oblanceolate, shortly rounded-triangular and obtusely mucronate at the apex, a little narrowed to an obtuse base, 3.5–8 cm. long, 1.3–3 cm. broad, rigidly coriaceous, glossy and reticulate above, lepidote below, the scales rather unequal and less than their own diameter apart, the epidermis between the scales rather densely papillous; midrib impressed above, prominent below and lepidote; lateral nerves about 6 on each side of the midrib, slightly distinct below; petiole 5.7 mm. long, at first ciliate,

grooved above, lepidote. *Inflorescence* up to 4-flowered; pedicels 5 mm. long, arising from about the same level, rather densely lepidote. *Calyx* about 2 mm. long, 5-lobed, densely lepidote outside, and fringed with a few long hairs, the lobes enlarging in fruit and becoming more or less triangular. *Corolla* white, scented, 5 cm. long, spreadingly funnel-shaped, sparingly lepidote only on the back of the lobes, rarely a few on one side of the tube; tube 3 cm. long, pubescent outside in the lower part; lobes 5, rounded, emarginate, about 2.5 cm. broad. *Stamens* 10, unequal, a little longer than the tube; filaments pubescent in the lower part; anthers 5 mm. long. *Ovary* 6-celled, lepidote; style much longer than the corolla, lepidote in the lower two-thirds, crowned by a rather small stigma. *Capsule* 2.5 cm. long, constricted at the base and apex, wrinkled and lepidote, tipped by a small portion of the persistent style, and girt at the base by the persistent enlarged ciliate calyx lobes.

KWEICHOW. Gan Chouen, April 1912, J. Cavalerie, 3883 (Herb. Edinb.).

3883 21. **Rhododendron roseatum,** Hutchinson, n. sp.*

A shrub 1–3 m. high. One-year-old branchlets brownish straw-coloured, rather closely spotted with small scales, apparently not hairy; young branchlets not seen. *Leaves* ovate,

* *Rhododendron roseatum*, Hutchinson, sp. nov.; affinis *R. ciliicalyci*, Franch., sed ramulis et petiolis estrigosis, foliis ovatis infra densissime lepidotis, corollae tubo extra dense lepidoto differt.

Frutex 1.25–3 m. altus. *Ramuli* annotini brunneo-straminei, squamis parvis arcte lepidoti, ut videtur esetosi, hornotini non visi. *Folia* ovata, acute triangulari-acuminata, basi late rotundata, 8–10 cm. longa, 3–4.5 cm. lata, rigide coriacea, supra primum lepidota, mox fere glabra et opaca, infra glauca et densissime lepidota, squamis inaequalibus rubris spatium diametro suo multo minus distantibus vel fere contiguis, epidermide inter squamas dense papillosa; costa media infra impressa, subdense lepidota, infra prominens et rotundata, lepidota, basi circiter 2.25 mm. lata, apicem versus sensim attenuata, apice calloso; nervi laterales utrinsecus 6–8, graciles, infra arcuati et paullo flexuosi, nervis secundariis et venis vix evolutis; petioli supra canaliculati, circiter 7 mm. longi et 3 mm. lati, lepidoti. *Inflorescentia* terminalis, circiter 4-flora, pedicellis umbellatis; cicatrices squamarum delapsarum calloso-incrassatae, fere contiguae; gemmarum squamae extra molliter et breviter pubescentes, lepidotae; pedicelli circiter 1 cm. longi, dense lepidoti. *Calyx* parvus, obscure 5-lobatus, circiter 1.5 mm. longus, extra ubique dense lepidotus, pilis debilibus circiter 1.25 mm. longis, arcte setoso-ciliatus. *Corolla* alba, extra roseo paullo suffusa (Forrest), late infundibuliformis, extra ubique praecipue in tubo densissime lepidota; tubus circiter 3 cm. longus, apice usque ad 5 cm. latus (complanatus); lobi rotundato-elliptici, circiter 4 cm. longi et lati, primum squamis marginati. *Stamina* 10, exserta, usque ad loborum medium extensa; filamenta in triente inferiore molliter pubescentia; antherae 5 mm. longae. *Ovarium* 6-loculare, 5 mm. longum, densissime lepidotum; stylus curvatus, corollae fere aequalis, in dimidio inferiore dense lepidotus, stigmate magno lobulato viscidulo coronatus. *Capsula* non visa.

acutely triangular-acuminate, broadly rounded at the base, 8–10 cm. long, 3–4.5 cm. broad, rigidly coriaceous, at first lepidote above, soon nearly glabrous and rather dull, glaucous and very densely lepidote below, the scales unequal in size, reddish, and much less than their own diameter apart, or nearly contiguous, the epidermis between the scales densely papillous; midrib sunken above and rather densely lepidote, prominent and rounded below and lepidote, about 2.25 mm. broad at the base, gradually tapered to the apex into the somewhat callous mucro; lateral nerves about 6–8 on each side of the midrib, slender, rather arcuate and a little flexuous below, with scarcely any visible secondary nerves or veins; petioles grooved above, about 7 mm. long and 3 mm. wide, lepidote. *Inflorescence* about 4-flowered, the pedicels arising from about the same level; scars of the fallen bud-scales callously thickened, nearly contiguous; bud-scales (only one seen) softly and very shortly pubescent outside and lepidote; pedicels about 1 cm. long, densely lepidote. *Calyx* small and obscurely 5-lobed, about 1.5 mm. long, densely scaly all over the outside, densely setose-ciliate with rather weak hairs about 1.25 mm. long. *Corolla* white, faintly flushed with rose outside (Forrest), widely funnel-shaped, densely scaly all over the outside, especially on the tube; tube about 3 cm. long, up to 5 cm. wide at the top when flattened out; lobes rounded-elliptic, about 4 cm. long and as much broad, at first fringed with scales. *Stamens* 10, exserted, reaching to about the middle of the corolla lobes; filaments softly pubescent in their lower third; anthers 5 mm. long. *Ovary* 6-celled, 5 mm. long, very densely scaly; style curved, nearly as long as the corolla, rather densely scaly in its lower half, crowned by a large lobulate somewhat viscid stigma. *Capsule* not seen.

WESTERN YUNNAN. Shweli-Salween Divide, lat. 25° 20′ N., 9000 ft., shrub 4–9 ft., on open scrub, May 1913, G. Forrest, 11866.

3814 22. **Rhododendron lasiopodum,** Hutchinson, n. sp.*

A shrub 4–5 m. high; one-year-old branchlets pale straw-coloured, rather blotched and sparingly lepidote; young branchlets densely lepidote; axillary leaf-buds already elongating at the time of flowering, when partly developed more or less shaped

* *Rhododendron lasiopodum*, Hutchinson, sp. nov.; affinis *R. ciliicalyci*, Franch., sed petiolis plerumque brevioribus, foliis infra dense lepidotis, corollae tubo lepidoto, stylo in partibus duabus inferioribus lepidoto differt.

Frutex 4–5 m. altus; ramuli annotini pallide straminei, parce lepidoti, juniores dense lepidoti. *Gemmae* foliiferae axillares sub anthesin jam elongatae, squamis inferioribus ad breve tempus persistentibus dorso leviter lepidotis et pilis brevibus

like a golf-club, the lowermost scale-leaves persisting for some time, fringed with short soft white hairs and slightly scaly down the back, the intermediate scale-leaves early falling off, with one or two of the upper ones persisting for some time below the young leaves. *Leaves* rather broadly elliptic, rounded at both ends or shortly triangular-acuminate at the apex, 6–11 cm. long, 3–5.5 cm. broad, rigidly coriaceous, lepidote above when young and ciliate, but soon becoming quite glabrous, shining and reticulate, glaucous and rather densely lepidote below, the scales ferruginous, unequal in size and less than their own diameter apart, the larger ones scattered, the epidermis densely clothed between the scales with rod-like papillae; petioles about 7 mm. long or less, rather flattened on the upper surface and grooved, fairly densely lepidote. *Inflorescence* apparently 2-flowered, the pedicels supported on a softly tomentose "foot" (above the scars of the scales) from which they disarticulate; scars of the fallen bud-scales rather lax and ladder-like with lepidote portions of the branchlet visible between; pedicels 1 cm. long, densely lepidote. *Calyx* very small, oblique, with an undulate margin, scaly outside and on the margin, not ciliate. *Corolla* white, yellow inside the base (Forrest), somewhat narrowly funnel-shaped from the base upwards, rather laxly scaly all over the outside; tube as long as the lobes, 4–4.5 cm. long, about 5 mm. in diameter at the base, and 5 cm. broad at the top when flattened out, softly pubescent towards the base; lobes oblong-orbicular, crenulate, 2.5–3 cm. broad. *Stamens* 10, unequal, the longest reaching to about the middle of the lobes; filaments densely and softly pilose in their lower half or third; anthers 5–6 mm. long. *Ovary* 5-celled, 7 mm. long, densely lepidote; style curved,

mollibus albidis barbatis, squamis intermediis mox caducis, paucis superioribus subpersistentibus. *Folia* late elliptica, utrinque rotundata vel apice triangulari-acuminata, 6–11 cm. longa, 3–5.5 cm. lata, rigide coriacea juventute supra lepidota et ciliata, mox glabra, nitida et reticulata, infra glauca et subdense lepidota, squamis ferrugineis inaequalibus spatium diametro suo minus distantibus, epidermide dense papillosa; petioli circiter 7 mm. longi vel minores, supra subcomplanati et canaliculati, subdense lepidoti. *Inflorescentia* terminalis, ut videtur biflora, pedicellis in pedem molliter tomentosum insertis ab eo disarticulatis; cicatrices squamarum delapsarum laxae et scalariformes; pedicelli 1 cm. longi, dense lepidoti. *Calyx* minimus, obliquus, extra et margine undulato lepidotus, eciliatus. *Corolla* alba, intra basin flava (Forrest), e basi paullo anguste infundibuliformis, extra ubique laxe lepidota; tubus lobis aequalis, 4–4.5 cm. longus, basi circiter 5 mm. diametro, apice (sicco et complanato) 5 cm. latus, basin versus molliter pubescens; lobi oblongo-orbiculares, crenulati, 2.5–3 cm. lati. *Stamina* 10, inaequalia, usque ad corollae loborum medium extensa; filamenta in triente vel dimidio inferiore dense et molliter pilosa; antherae 5–6 mm. longae. *Ovarium* 5-loculare, 7 mm. longum, dense lepidotum; stylus curvatus, corollae fere aequalis, in dimidio inferiore lepidotus, epilosus, stigmate viscido lobulato circiter 3.5 mm. lato coronatus. *Capsula* non visa.

nearly as long as the corolla, lepidote in its lower half, not hairy, crowned by the lobulate viscid stigma about 3.5 mm. broad. *Capsule* not seen.

WESTERN YUNNAN. Shweli-Salween Divide, lat. 25° 5′ N., 8000-9000 ft., in pine forest, shrub 12–15 ft., flowers white, yellow inside the base, fragrant, May 1913, G. Forrest, 9919.

This is about the nearest approach to *R. ciliicalyx*, Franch., collected by Mr Forrest. It seems sufficiently distinct, however, in its shorter petioles, much more densely scaly leaves, lepidote corolla tube, and the style lepidote for about two-thirds of its length.

The name *lasiopodum* applies to the small softly tomentose portion of the axis of the inflorescence, which protrudes above the scars of the floral bud-scales, and from which the pedicels eventually break off.

3806 23. **Rhododendron dendricola,** Hutchinson, n. sp.*

A small shrub 1.25–2 m. high, generally epiphytic at summits of trees 16–20 m. high; one-year-old branchlets sparingly lepidote, apparently not hairy; young branchlets evidently well advanced at flowering time, laxly lepidote. Leaves oblong-elliptic, rather abruptly and subacutely acuminate, rounded-obtuse at the base, 8–12 cm. long, 3–5 cm. broad, rigidly coriaceous, glabrous dull and not reticulate above (lepidote when quite young), densely lepidote beneath, the scales reddish-brown and a little less than their own diameter apart, rather unequal in size, the lower epidermis between the scales densely papillous; midrib impressed above, prominent and finely

* *Rhododendron dendricola,* Hutchinson, sp. nov., affinis *R. lasiopodo,* Hutchinson, sed foliis abrupte subacute acuminatis, pedicellis basi non lasiopodis, calyce parce ciliato differt.

Frutex 1.25–2 m. altus, plerumque in arboribus epiphyticus; ramuli annotini parce lepidoti, epilosi, juniores sub anthesin jam bene evoluti, lepidoti. *Folia* oblongo-elliptica, abrupte et subacute acuminata basi rotundato-obtusa, 8–12 cm. longa, 3–5 cm. lata, rigide coriacea, glabra, supra opaca et non reticulata (juniora lepidota), infra dense lepidota, squamis rubro-brunneis spatium diametro suo minus distantibus inaequalibus, epidermide inferiore dense papillosa; costa supra impressa, infra prominens et lepidota; nervi laterales utrinsecus 7–8, infra inconspicui; petioli 1–1.3 cm. longi, minute lepidoti, juniores parce ciliati. *Inflorescentia* ut videtur 3-flora, umbellata; pedicelli 1 cm. longi, lepidoti, subrobusti. *Calyx* undulatus, brevis, circiter 1.25 mm. longus, extra lepidotus, margine parce ciliatus. *Corolla* alba, roseo suffusa, petalis inferioribus aurantiaco-maculata, circiter 8 cm. longa; tubus late infundibuliformis, basin versus abrupte constrictus, circiter 3.5 cm. longus, extra dense lepidotus et basi minute pubescens; lobi 5, rotundati, extra lepidoti. *Stamina* 10, exserta; filamenta in dimidio inferiore dense pilosa; antherae 7 mm. longae. *Ovarium* 6-loculare, 8 mm. longum, costatum, dense lepidotum, basi disco tomentoso cinctum; stylus corollae aequalis, in dimidio inferiore lepidotus, stigmate disciformi multilobulato coronatus. *Capsula* non visa.

lepidote below; lateral nerves about 7–8 on each side of the midrib, faint below; petiole 1–1.3 cm. long, finely lepidote, sparingly ciliate when quite young. *Inflorescence* (only one seen, apparently 3-flowered) umbellate; pedicels 1 cm. long,

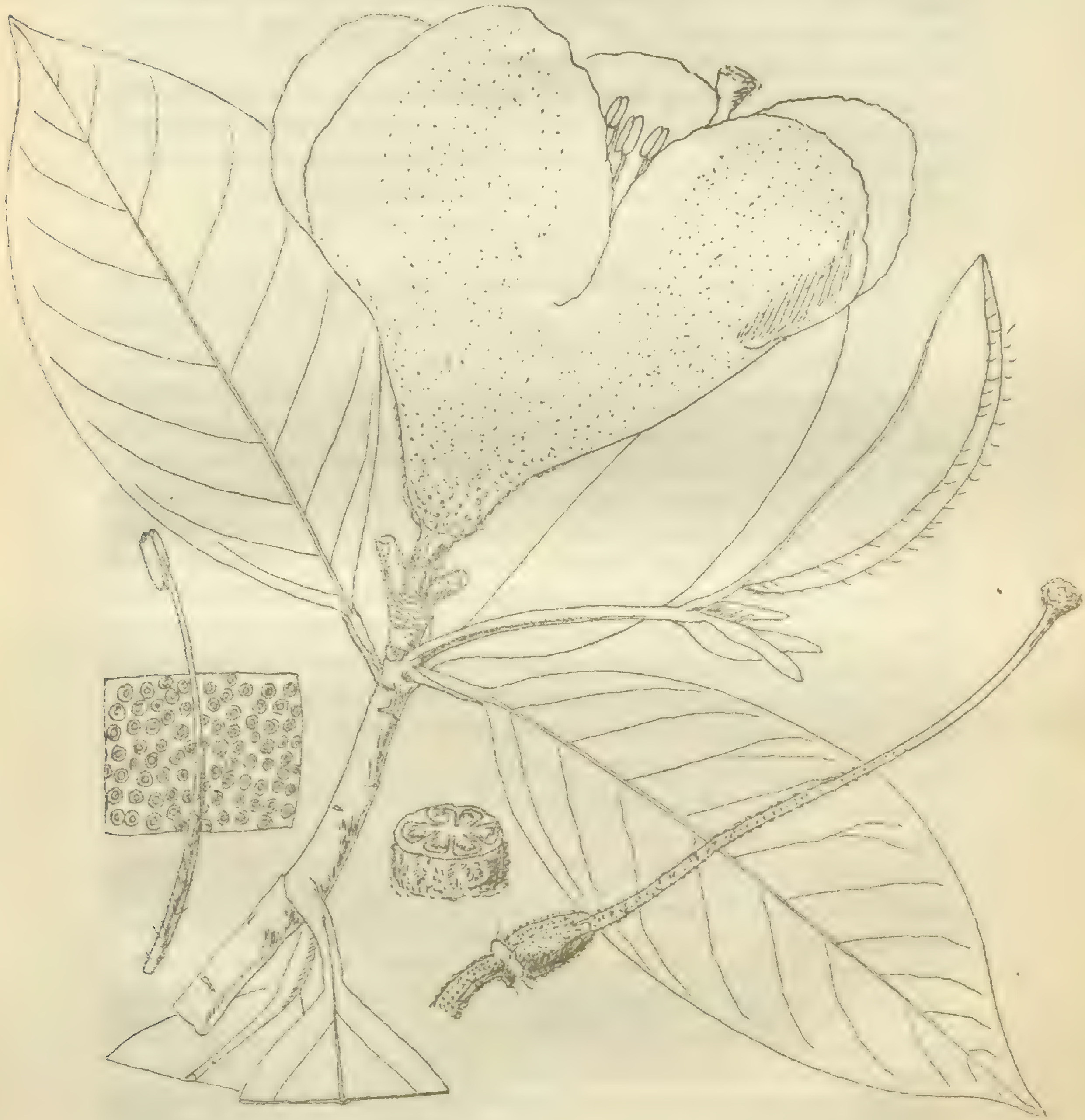

FIG. 8.—*Rhododendron dendricola*, Hutchinson, n. sp. Nat. size.

lepidote, rather stout. *Calyx* an undulate rim, scaly outside and with a few slender hairs on the margin about 1.25 mm. long. *Corolla* white tinged with pink, with an orange mark on lower petals, about 8 cm. long; tube widely funnel-shaped, rather abruptly constricted towards the base, about 3.5 cm. long, densely lepidote outside and minutely pube-

scent around the base; lobes 5, rounded, lepidote outside. *Stamens* 10, reaching to about the middle of the corolla lobes; filaments densely pilose in the lower half; anthers 7 mm. long. *Ovary* 6-celled, 8 mm. long, ribbed, densely lepidote, girt at the base with a lobulate tomentose disk; style as long as the corolla, lepidote in the lower half, crowned by a large disk-like many lobulate stigma. *Capsule* not seen.

N. BURMA. Nwai Valley; small shrub 4–6 ft., generally epiphytic at tops of 50–60 ft. trees; trusses with few flowers, white tinged with pink, orange mark inside on lower petals, 11th May 1914, Kingdon Ward, 1538 (Herb. Edinb.).

24. **Rhododendron Ludwigianum,** Hosseus in Beihefte z. Bot. Centralbl. xxviii. 422 (1911). *Rhododendron sp.*, Hosseus, l.c. xxvii. 506 (1910).

A shrub 1–1.5 m. high; branches evidently very short and almost leafless at the time of flowering, closely warted with the scars of the fallen leaves; one-year-old branchlets very short and lepidote. *Leaves* (only three small ones seen) obovate, narrowed to an obtuse base, triangular at the apex, 3–4 cm. long, 1.5–2 cm. broad, rigidly coriaceous, dull and impressed reticulate above and apparently glabrous, densely lepidote below, the scales about one-half their own diameter apart, dark brown in the middle with a narrow paler fringe, the epidermis papillous between the scales; midrib impressed above, prominent and rather densely lepidote beneath; lateral nerves 5–6 on each side of the midrib, impressed above, distinct below; petiole about 4 mm. long, grooved above, lepidote. *Inflorescence* 2–3 flowered; pedicels inserted on a densely villous very short axis, 3–6 mm. long, very densely lepidote; bracts linear-spathulate, softly villous and lepidote. *Calyx* small, obscurely lobed, densely lepidote, very sparingly ciliate. *Corolla* white and rose (Hosseus), about 6.5 cm. long, densely and softly villous-pubescent all over the outside, lepidote on the back of the lobes and down one side of the tube; tube about 3.5 cm. long, funnel-shaped; lobes 5, rounded, glabrous towards the margin. *Stamens* 10, a little exserted; filaments pilose in the lower $\frac{1}{3}$, the longest about 3 cm. long; anthers 5–6 mm. long. *Ovary* 6-celled, lepidote; style lepidote in the lower half; stigma rather small and disk-like, about 3 mm. wide (when dry). *Capsule* not seen.

SIAM. Doi Djieng Dao, Kalkgipfel III, 6600 ft., shrub 3–4$\frac{1}{2}$ ft. high, fls. white-rose, twigs without leaves, 17th February 1905, C. C. Hosseus, 401.

3803 25. **Rhododendron rufosquamosum,** Hutchinson, n. sp.*

A shrub 1 m. high; older branchlets covered with smooth grey bark; one-year-old branchlets sparingly lepidote, about 3.5 mm. thick; axillary leaf-buds still dormant at the time of flowering, the scale leaves rather lax, leathery, and minutely fringed with hairs a little keeled and lepidote near the middle. *Leaves* oblanceolate, obtusely triangular-acuminate at the apex, gradually narrowed to an acute base, 7–12 cm. long, 1.8–4 cm. broad, rather thinly coriaceous, strongly reticulate above and lepidote towards the midrib, densely rufous-lepidote below, the scales about one-half their own diameter or less apart, with a few larger and darker coloured ones scattered here and there, the lower epidermis between the scales densely papillous; midrib impressed above, prominent and lepidote beneath; lateral nerves very slender, about 8 on each side of the midrib, a little raised on the upper surface, slightly prominent below; petiole 0.8–1.3 cm. long, deeply grooved on the upper side, punctate-lepidote. *Inflorescence* few-flowered (probably about 3), the pedicels arising from approximately the same level; pedicels 5–7 mm. long, lepidote. *Calyx* very small, plate-like, scarcely lobed, densely lepidote outside and closely fringed with weak hairs about 3 mm. long. *Corolla* white, pink in bud (Henry), tubular-funnel-shaped, rather narrow towards the base, about 7 cm. long, lepidote all over the outside except towards the margin of the lobes; tube 3.5–4 cm. long, softly pubescent at the base outside; lobes 5, rounded-oblong, about 2.5 cm.

* *Rhododendron rufosquamosum,* Hutchinson, sp. nov.; affinis *R. supranubio,* Hutchinson, sed foliis basi longe attenuatis stylo in partibus duabus inferioribus lepidoto differt.

Frutex 1 m. altus; ramuli vetustiores cortice cinereo levi obtecti, annotini parce lepidoti, circiter 3.5 mm. crassi; gemmae floriferae axillares sub anthesin adhuc non elongatae, squamis laxis coriaceis et pilis minutis marginatis carinatis medium versus lepidotis. *Folia* oblanceolata, obtuse triangulari-acuminata, basi acuto sensim angustata, 7–12 cm. longa, 1.8–4 cm. lata, tenuiter coriacea, supra reticulata et medium versus lepidota, squamis spatium diametro suo dimidius minus distantibus, epidermide inter squamas dense papillosa; costa supra impressa infra prominens et lepidota; nervi laterales gracillimi, utrinsecus circiter 8, supra parum elevati, infra leviter prominentes; petioli 0.8 cm. longi, supra profunde canaliculati, punctato-lepidoti. *Inflorescentia* pauciflora (probabiliter 3-), pedicellis subumbellatis; pedicelli 5–7 mm. longi, lepidoti. *Calyx* minimus patelliformis, vix lobatus, extra dense lepidotus et pilis debilibus circiter 3 mm. longis marginatus. *Corolla* alba, alabastro rosea (Henry), tubuloso-infundibuliformis, basin versus angusta, circiter 7 cm. longa, extra ubique loborum marginibus exceptis lepidota; tubus 3.5–4 cm. longus, extra basi molliter pubescens; lobi 5, rotundato-oblongi, circiter 2.5 cm. lati. *Stamina* 10, ad loborum medium exserta; filamenta in quadrante inferiore molliter pubescentia; antherae 5 mm. longae. *Ovarium* 6-loculare, 5 mm. longum, lepidotum, basi disco molliter tomentoso cinctum, apice rotundato-truncatum; stylus corollae fere aequalis, in partibus duabus inferioribus lepidotus, stigmate lobulato coronatus. *Capsula* non visa.

broad. *Stamens* 10, exserted to about the middle of the lobes; filaments softly pubescent in the lowermost $\frac{1}{4}$; anthers 5 mm. long. *Ovary* 6-celled, 5 mm. long, lepidote, girt with a softly tomentose disk at the base, rounded truncate at the top; style nearly as long as the corolla, lepidote in the lower $\frac{3}{4}$, crowned by a fist-like lobulate stigma. *Capsule* not seen.

S.W. YUNNAN. Szemao Hills, 4800 ft., shrub 3 ft., fls. white (buds pink), 9th May, A. Henry, 11983.

26. **Rhododendron Scottianum,** Hutchinson, n. sp.*

A shrub up to 12 ft. high; one-year-old branchlets rather densely lepidote with small scales, pale straw-coloured or brownish when dry, not strigose (so far as observed); young branchlets densely lepidote; axillary leaf-buds mostly already well elongated at the time of flowering, the scales slightly lepidote on the back and fringed with rather short white soft hairs. *Leaves* obovate or more rarely elliptic-obovate, slightly narrowed to a broadish base, with a more or less rounded-triangular subacutely mucronate apex, 6–10 cm. long, 2.5–4 cm. broad, rather rigidly coriaceous, at first lepidote above but soon glabrous and faintly reticulate on the upper surface, ferruginous below with dense scales, the scales often nearly contiguous and never

* *Rhododendron Scottianum,* Hutchinson, sp. nov.; affinis *R. ciliicalyci,* Franch., sed foliis plerumque obovatis infra squamis fere contiguis corollae tubo extra dense lepidoto, stylo in partibus duabus inferioribus lepidoto differt.

Frutex usque ad 4 m. altus; ramuli annotini subdense lepidoti, squamulis parvis, sicco pallide straminei vel brunnei, non strigosi; ramuli juniores dense lepidoti. *Gemmae* foliiferae axillares sub anthesin jam elongatae, squamis dorso leviter lepidotis pilis brevibus albidis mollibus marginatis. *Folia* obovata vel rare elliptico-obovata, ad basin sublatum leviter angustata, apice triangularia et subacute mucronata, 6–10 cm. longa, 2.5–4 cm. lata, rigide coriacea, primum supra lepidota mox glabra et inconspicue reticulata, infra squamis densis ferruginea, inter squamas densissime papillosa, papillis conspicuis lineatis; petioli 0.5–1 cm. longi, verrucosi et lepidoti, supra canaliculati, primum cum foliorum marginibus setoso-ciliati, demum eciliati. *Inflorescentia* terminalis, folia superans, 2–4-flora, pedicellis umbellatis; cicatrices squamarum gemmarum delapsarum laxae, labrosae transverse lineares, stramineae; pedicelli 1–1.5 cm. longi, circiter 2.5 mm. crassi, squamis contiguis vel imbricatis densissime lepidoti. *Calyx* plerumque parvus et plus minusve patelliformis, obscure lobatus vel rare lobo uno elongato et circiter 1 cm. longo, lobis normalibus extra dense lepidotis et marginibus pilis longissimis marginatis (in floribus paucis rare subeciliatis). *Corolla* alba, interdum externe rosea suffusa, intra basin flava (Forrest), e basi latissime infundibuliformis, extra praesertim in tubo dense lepidota; tubus lobis paullo brevior, 3–3.5 cm. longus, extra basin molliter et breviter pubescens; lobi 5, rotundati, 4 cm. longi, crenulati, extra lepidoti. *Stamina* 10–11, circiter ad medium corollae loborum extensa, leviter inaequalia; filamenta gracilia, in quadrante inferiore dense et molliter pilosa; antherae 4–4.5 mm. longae. *Ovarium* 5–7-loculare, 6 mm. longum, dense lepidotum; stylus curvatus, corollae aequalis, in partibus duabus inferioribus lepidotus, nec pubescens, stigmate viscido lobulato circiter 3.5 mm. lato coronatus. *Capsula* non visa.

more than half their own diameter apart, the epidermis very densely covered between the scales with conspicuous rod-like papillae; petioles 0.5–1 cm. long, wrinkled and lepidote, with a groove on the upper side, setose-ciliate like the leaf-margins when quite young, soon not setose. *Inflorescence* tending to obscure the leaves, 2–4-flowered, the pedicels arising from approximately the same level; scars of the fallen bud-scales rather lax and rim-like, transversely linear, straw-coloured; pedicels 1–1.5 cm. long, about 2.5 mm. thick, very densely lepidote with contiguous or overlapping scales. *Calyx* mostly small and saucer-shaped, obscurely lobed or rarely one lobe elongated to about 1 cm. long, the normal lobes densely scaly outside and fringed with long hairs on the margin (in some flowers these hairs are poorly developed). *Corolla* white occasionally flushed with rose outside, with a yellow blotch inside at the base (Forrest), very widely funnel-shaped from the base, rather densely scaly outside especially on the tube; tube a little shorter than the lobes, 3–3.5 cm. long, softly and shortly pubescent outside the base; lobes 5, rounded, 4 cm. long, crenulate, lepidote outside. *Stamens* 10–11, reaching to about the middle of the lobes, slightly unequal; filaments slender, densely and softly pilose on their lower $\frac{1}{4}$; anthers 4–4.5 mm. long. *Ovary* 5–7-celled, 6 mm. long, densely lepidote; style curved, about as long as the corolla, lepidote in its lower $\frac{2}{3}$ or slightly higher, not hairy as well, crowned by the distinctly lobulate viscid stigma about 3.5 mm. broad. *Capsule* not seen.

WESTERN YUNNAN. Hills to the north-west of Tengyueh, lat. 25° N., faces of cliffs and amongst scrub on rocky slopes, 6000 ft., shrub 3–12 ft., flowers exterior white or flushed with rose, interior white with a faint tinge of canary-yellow towards the base, fragrant, May 1912, G. Forrest, 7516. Hills north-west of Tengyueh, lat. 25° 10′ N., open rocky situations on cliffs, etc., 8000 ft., shrub 2–3 ft., flowers white, flushed crimson exterior, fragrant, May 1913, G. Forrest, 11877. Hills west of Chutong, lat. 25° 25′ N., amongst scrub, 6000–7000 ft., shrub 3–5 ft., flowers white, flushed with rose exterior, May 1913, G. Forrest, 9994. Head of the Hsin-kuan Valley, lat. 25° 35′ N., on cliffs and amongst scrub, 6000 ft., shrub 2–4 ft., flowers white, occasionally flushed with rose outside, with a blotch of yellow at the base inside, May 1913, G. Forrest, 10008 (type).

This beautiful species will probably prove to be the gem of the *ciliicalyx* alliance. It is named in honour of my late friend and colleague, Munro Briggs Scott, who was killed at the battle of Arras in April 1917 (*cf.* Kew Bull. 1917, 210).

3816 27. **Rhododendron pilicalyx,** Hutchinson, n. sp.*

A shrub 1.25 m. high ; two-year-old branchlets covered with smooth grey bark, the one-year-old ones brownish and finely lepidote ; axillary leaf-buds just beginning to elongate at the time of flowering, the scales very small, lepidote outside, and fringed with soft white hairs. *Leaves* obovate or obovate-elliptic, acutely triangular-acuminate at the apex, a little narrowed to an obtuse or somewhat cuneate base, 5–10 cm. long, 2–4 cm. broad, coriaceous, glabrous and dull on the upper surface when mature, very densely lepidote below with reddish or purplish-brown scales, the scales contiguous, very small, with a few larger and blacker ones scattered here and there, the epidermis between the scales densely papillous ; midrib impressed above prominent and lepidote below ; lateral nerves 6–7 on each side of the midrib, diverging from it at an angle of about 45°, slightly prominent below when dry, fading towards the margin ; petiole 0.8–1.3 cm. long, grooved above, lepidote, ciliate (the hairs eventually falling off). *Inflorescence* 3–5-flowered ; pedicels arising from approximately the same level, 0.8–1.3 cm. long, densely lepidote. *Calyx* unequally 5-lobed, the dorsal (adaxial) lobe the longest, up to 4 mm. long, lobes ovate-triangular, rounded at the apex, lepidote outside, closely fringed with rather stiff long hairs. *Corolla* white with a little pink (Henry), 6–7 cm. long, 5-lobed, lepidote all over the outside except towards the margins of the lobes ; tube funnel-shaped, 2.5–3.5 cm. long, minutely pubescent outside the base, rather

* *Rhododendron pilicalyx*, Hutchinson, sp. nov. ; affinis *R. Surasiano*, Balf. f. et Craib, sed squamis foliorum minoribus subcarnosis purpureo-brunneis antheris longioribus differt.

Frutex 1.25 m. altus ; ramuli biennes cortice cinereo levi obtecti, annotini brunnescentes et lepidoti ; gemmae foliiferae axillares sub anthesin leviter productae, perulis minimis, lepidotis, pilis mollibus albidis marginatis. *Folia* obovata vel obovato-elliptica, apice acute triangulari-acuminata, ad basin obtusum vel parum cuneatum angustata, 5-10 cm. longa, 2–4 cm. lata, coriacea, supra maturitate glabra et opaca, infra densissime squamis contiguis vel imbricatis rubro-brunneis lepidota, epidermide dense papillosa ; costa media supra impressa, infra prominens et lepidota ; nervi laterales utrinsecus 6–7, a costa sub angulo 45° abeuntes, sicco infra prominuli, marginem versus evanidi ; petioli 0.8–1.3 cm. longi, supra canaliculati, lepidoti, ciliati, pilis deciduis. *Inflorescentia* 3–5-flora ; pedicelli subumbellati, 0.8–1.3 cm. longi, dense lepidoti. *Calyx* inaequaliter 5-lobatus, lobo adaxiali longissimo, usque ad 4 mm. longus, lobis ovato-triangularibus apice rotundatis extra lepidotis pilis rigidis longis crebre marginatis. *Corolla* alba et leviter rosea, 6–7 cm. longa, 5-lobata, extra ubique loborum marginibus exceptis lepidota ; tubus infundibuliformis, 2.5–3.5 cm. longus, basi extra minute pubescens, dense lepidotus ; lobi rotundati, marginibus undulatis. *Stamina* 11–13, ad loborum medium exserta ; filamenta in triente vel quadrante inferiore molliter pubescentia ; antherae 5 mm. longae. *Ovarium* 5-loculare, lepidotum ; stylus corollae fere aequilongus, in partibus duabus inferioribus lepidotus stigmate magno depresso lobulato coronatus. *Capsula* non visa.

densely lepidote; lobes rounded, with wavy margins. *Stamens* 11–13, exserted, reaching to about the middle of the lobes; filaments softly hairy in the lower $\frac{1}{3}$ or $\frac{1}{4}$; anthers 5 mm. long. *Ovary* 5-celled, lepidote; style nearly as long as the corolla, lepidote in the lower $\frac{2}{3}$ crowned by a large depressed lobulate stigma. *Capsule* not seen.

S.E. YUNNAN. Mengtsz, northern mountain forests, 8000 ft., fls. white, with a little pink, A. Henry, 10524.

28. **Rhododendron Surasianum,** Balf. f. et Craib in Notes, Roy. Bot. Gard. Edinb. x. 160 (1917).

A spreading shrub about 4 m. high; branchlets short, laxly leafy towards the apex, the older ones covered with smooth grey bark; young branchlets finely lepidote, about 2.5 mm. thick, apparently not bristly; axillary leaf-bearing buds very small, and dormant at the time of flowering. *Leaves* elliptic-obovate or oblong-obovate, rounded to a very shortly cuneate base, acutely acuminate at the apex, 6–10 cm. long, 2.3–4 cm. broad, coriaceous, glabrous above when mature and slightly shining, slightly bullately reticulate, densely lepidote below, the scales pale brown and contiguous or overlapping, with a few larger ones scattered here and there, the body of the scales somewhat dry and depressed in the middle, with a narrow membranous fringe, the epidermis between the scales rather laxly papillous; midrib impressed above, prominent below and rather densely lepidote; lateral nerves 6–7 on each side of the midrib, a little impressed above, straw-coloured and flexuous below, obscurely looped and branched towards the margin; petiole about 1 cm. long, grooved above, lepidote. *Flower bud-scales* thinly coriaceous, slightly keeled and densely lepidote towards the apex, apiculate, fringed with soft white hairs. *Inflorescence* 2–3-flowered, umbellate; pedicels nearly 1.5 cm. long, densely lepidote with rather dry flake-like scales. *Calyx* saucer-like, undulately lobed, about 2 mm. long, densely lepidote outside and bristly with rather short stiff hairs on the margin. *Corolla* pale pink, about 7.5 cm. long; tube about 4 cm. long, infundibuliform, fairly narrow at the base, rather densely lepidote outside, and very finely pubescent towards the base; lobes 5, broadly oblong, about 3 cm. long, lepidote outside except towards the margin. *Stamens* 10, unequal, exserted; filaments pubescent towards the base; anthers 6–7 mm. long. *Ovary* 5-celled, 7 mm. long, very densely lepidote; style as long as the corolla, rather densely lepidote in the lower $\frac{2}{3}$, crowned by a large deeply lobulate stigma. *Capsule* not seen.

NORTHERN SIAM. Chiengmai, Doi Sutep, 4500 ft., spreading

shrub about 12 ft. high, fls. pale pink, on rocky ground in open evergreen jungle, 7th June 1914, A. F. G. Kerr, 3238.

This species is almost a counterpart of my *R. pilicalyx* from South-East Yunnan. But the scales on the lower leaf-surface of the latter are smaller and more fleshy in the middle, and the epidermis is fairly clearly visible between them. The anthers too are decidly longer, about 5 mm. long in *R. pilicalyx* and 7 mm. long in *R. Surasianum*. These taken into consideration with the widely separated distribution leave very little doubt in my mind that the two are distinct species.

3818 29. **Rhododendron supranubium,** Hutchinson, n. sp.*

Shrub 1½–4 ft. high; branches twiggy, short; one-year-old branchlets more or less straw-coloured, laxly lepidote, about 3 mm. thick; young branchlets densely lepidote, the scale-leaves in the lower part gradually changing into foliage leaves; leaf-bearing axillary buds mostly just elongating at the time of flowering, the bud-scales broadly ovate-orbicular, subobtusely

* *Rhododendron supranubium*, Hutchinson, sp. nov.; affinis *R. ciliicalyci*, Franch., sed petiolis brevioribus, foliis plerumque obovato-oblanceolatis minoribus squamis infra densioribus, corollae tubo extra dense lepidoto differt.

Frutex usque ad 1.25 m. altus; rami breves; ramuli annotini plus minusve straminei, laxe lepidoti, circiter 3 mm. crassi, juniores dense lepidoti, foliis squamiformibus inferioribus ad folia normalia transeuntibus; gemmae foliiferae sub anthesin plerumque modo elongatae, squamis late ovato-orbicularibus subobtuse apiculatis coriaceis squamularum lineis duabus dorso ornatis, marginibus pilis albidis mollibus instructis. *Folia* oblanceolata vel obovato-oblanceolata, rare elliptica, breviter et abrupte obtuse acuminata, 3.5–9 cm. longa, 1.3–3.3 cm. lata, rigide coriacea, supra juventute dense lepidota et ciliata, maturitate glabra et leviter nitida, infra glauca et dense lepidota, squamis aureo-brunneis inaequalibus spatium diametro suo minus distantibus, epidermide inter squamas dense papillosa; petioli 0.5–1 cm. longi, squamis parvis subdense obtecti, frequenter setis paucis marginati, supra canaliculati. *Inflorescentia* usque ad 3-flora, saepe 1-flora, pedicellis umbellatis, infra basin pilis mollibus albidis circumdatis; cicatrices squamarum delapsarum subdensae, labroses; squamae exteriores ovato-orbiculares, breviter obtuse acuminatae, circiter 1.5 cm. longae, tenuiter coriaceae in parte media lata lepidotae, pilis brevibus mollibus albidis marginatae; bracteolae fere filiformes, apicem versus paullo spatulatae, circiter 2.5 cm. longae, extra pilis albidis mollibus indutae; pedicelli 1 cm. longi, circiter 2 mm. crassi, dense lepidoti. *Calyx* plus minusve cupularis vel patelliformis, plerumque distincte sed interdum obscure lobatus, usque ad 2 mm. longus et 3 mm. latus, extra lepidotus, pilis longis ciliatus vel rare eciliatus. *Corolla* opaco-alba externe roseo suffusa (Forrest), e basi late infundibuliformis; tubus lobis aequalis vel paullo longior, uno latere circiter 3 cm. longus, basi circiter 5 mm. diametro, apice 4.5 cm. latus (siccus et complanatus), extra dense lepidotus, basin versus molliter pubescens; lobi 5, circiter 3 cm. longi et 2.3 cm. lati, extra lepidoti, marginibus crenulato-lepidotis. *Stamina* 10, inaequalia, supra medium corollae loborum pertinentia; filamenta in dimidio inferiore dense pilosa; antherae 4.5 mm. longae, sicco brunneae. *Ovarium* 6-loculare, 7 mm. longum, dense lepidotum; stylus corolla paullo brevior, in dimidio inferiore dense lepidotus, stigmate disciformi viscido coronatus. *Capsula* non visa.

apiculate, coriaceous, with two or three lines of small golden scales down the back, fringed with soft white hairs. *Leaves* oblanceolate or obovate-oblanceolate, rarely elliptic, shortly and rather abruptly obtusely acuminate, 3.5–9 cm. long, 1.3–3.3 cm. broad, rigidly coriaceous, when young rather densely

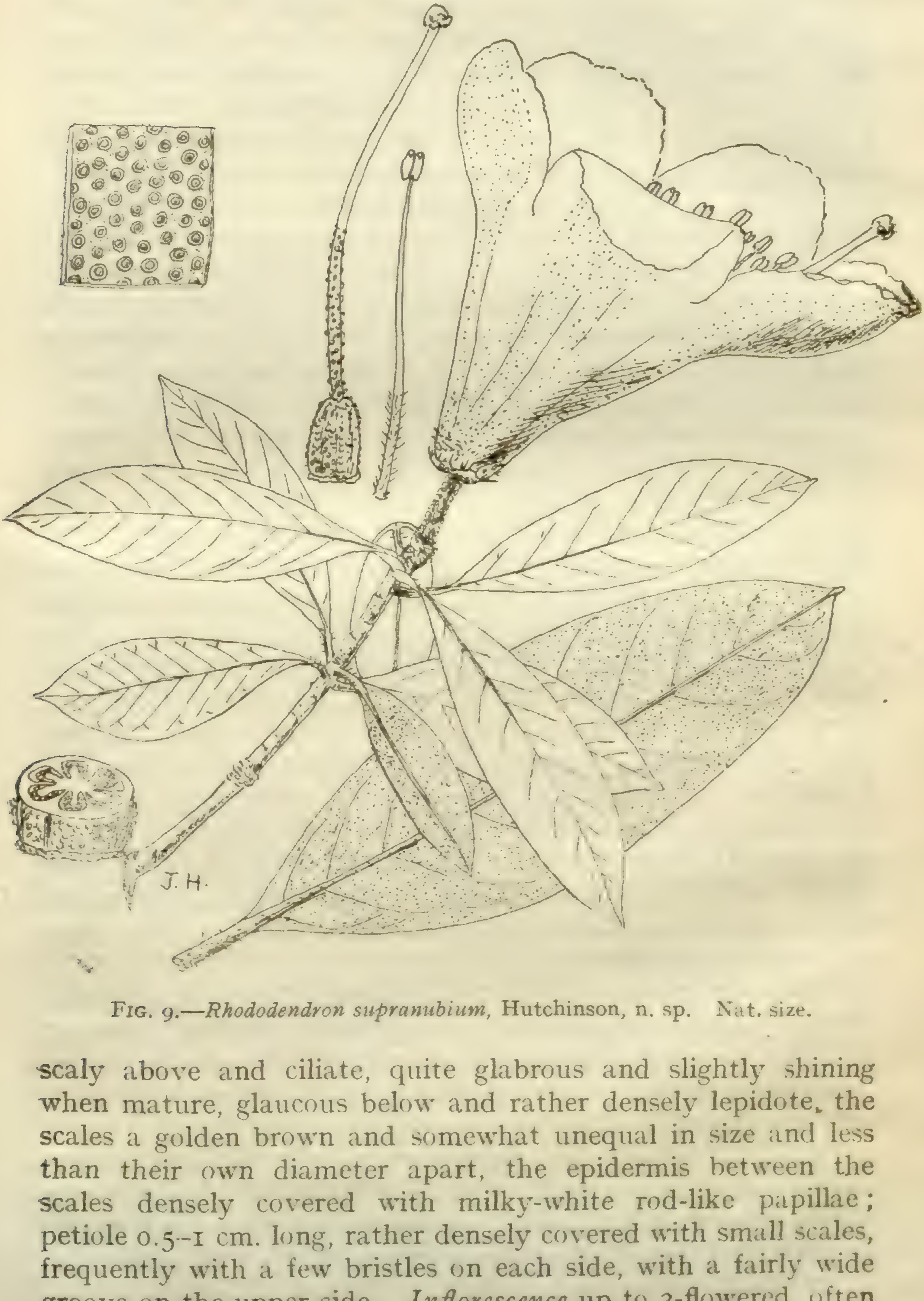

FIG. 9.—*Rhododendron supranubium*, Hutchinson, n. sp. Nat. size.

scaly above and ciliate, quite glabrous and slightly shining when mature, glaucous below and rather densely lepidote, the scales a golden brown and somewhat unequal in size and less than their own diameter apart, the epidermis between the scales densely covered with milky-white rod-like papillae; petiole 0.5–1 cm. long, rather densely covered with small scales, frequently with a few bristles on each side, with a fairly wide groove on the upper side. *Inflorescence* up to 3-flowered, often

1-flowered, the pedicels arising from the same level, with a fringe of soft white hairs below the base of each; scars of the fallen bud-scales rather dense, rim-like; outer bud-scales ovate-orbicular, shortly obtusely acuminate, about 1.5 cm. long, thinly coriaceous, lepidote up the broad middle portion, fringed with short soft white hairs; bracteoles almost filiform, a little spathulate towards the apex, about 2.5 cm. long, covered on the outside with soft white hairs; pedicels 1 cm. long, about 2 mm. thick, densely lepidote. *Calyx* more or less cupular or saucer-shaped, mostly distinctly but sometimes obscurely lobed, up to 2 mm. long and about 3 mm. broad, lepidote outside, mostly fringed with long hairs but these sometimes absent on the same flower-head. *Corolla* dull white with rose exterior (Forrest), widely funnel-shaped from the base upwards; tube as long as or a little longer than the lobes, about 3 cm. long on one side and 2.5 cm. long on the other, about 5 mm. in diameter at the base, 4.5 cm. wide at the top when flattened out, rather densely lepidote outside, softly pubescent towards the base; lobes 5, about 3 cm. long and 2.3 cm. broad, lepidote outside and crenulate-lepidote on the margin. *Stamens* 10, unequal, the longest reaching to above the middle of the corolla lobes; filaments rather densely pilose in their lower half; anthers 4.5 mm. long, chocolate-brown (when dry). *Ovary* 6-celled, 7 mm. long, densely lepidote; style a little shorter than the corolla, rather densely scaly in the lower half, crowned by a viscid disk-like stigma. *Capsule* not seen.

WESTERN YUNNAN. Dry rocky situations on the eastern flank of the Tali Range, lat. 25° 40′ N., alt. 10,000–11,000 ft., shrub 3–6 ft., flowers white, exterior tinged rose, fragrant, June–July 1906, G. Forrest, 4159. Eastern flank of the Tali Range, lat. 25° 40′ N., 10,000–11,000 ft., open stony pasture, shrub 1½–3 ft., flowers white washed with rose outside, fragrant, May 1910, G. Forrest, 6764A. Eastern flank of the Tali Range, lat. 25° 40′ N., alt. 11,000–12,000 ft., shrub 2–4 ft., flowers dull white, exterior rose, fragrant, on ledges of cliffs, June 1910, G. Forrest, 6764 (type).

This may be regarded as a near alpine relation of *R. ciliicalyx*, Franch. Besides occurring at a much higher altitude, however, it differs from that species in its shorter petioles, smaller leaves, much more densely arranged scales, by its flowers tending to become solitary, and by the densely lepidote corolla.

Mr J. C. Williams has this species in cultivation at Caerhays Castle, Cornwall, under Forrest's number 6764. He has very kindly sent me a leafy shoot grown out of doors, and on the leaves I find the papillae characteristic of the wild specimens. Occurring at such a high altitude in Yunnan, 10,000–12,000 ft.,

the species should prove hardy in this country, although probably susceptible to late spring frosts. It will no doubt be suitable for planting in the rock garden.

30. **Rhododendron Smilesii,** Hutchinson, n. sp.*

A tree 20 ft. high; one-year-old branchlets lepidote and with a few bristly hairs. *Leaves* obovate-oblanceolate or oblong-oblanceolate, obtusely mucronate and triangular at the apex, gradually narrowed from about the middle to an obtuse base, 4.5–6.5 cm. long, 1.8–2.5 cm. broad, rather thinly and rigidly coriaceous, dull and glabrous above, densely lepidote beneath, the scales dark brown and less than their own diameter apart, the epidermis between the scales papillous; midrib impressed above, prominent below, slightly lepidote; lateral nerves about 6 on each side of the midrib, just visible below, the basal pair ascending acutely from the base; petiole 5 mm. long, widely V-shaped, grooved in the middle, densely lepidote. *Inflorescence* 3-flowered, umbellate, the axis villous; pedicels about 3 mm. long, lepidote. *Calyx* small, about 1.5 mm. long, obscurely lobed, lepidote outside, not ciliate. *Corolla* small, about 4 cm. long, lepidote, nearly all over the outside, rather sparingly so on the tube and not at all towards the margins of the lobes; tube a little shorter than the lobes; lobes 5, elliptic-rounded, with finely undulate margins. *Stamens* 10, a little longer than the tube; filaments pubescent in the lower $\frac{1}{4}$; anthers 4 mm. long. *Ovary* 5-celled, densely lepidote; style 3 cm. long, lepidote in the lower half, crowned by a lobulate stigma about 3 mm. wide. *Capsule* not seen.

NORTHERN SIAM. Pu Sai Lai Leng, tree 20 ft. high, flowers white, 1st April 1893, F. H. Smiles (Herb. Kew).

* *Rhododendron Smilesii,* Hutchinson, sp. nov.; species siamensis affinis *R. supranubio,* Hutchinson, sed foliis minoribus infra non glaucis calyce eciliato corolla breviore differt.

Arbor 6 m. alta; ramuli annotini lepidoti et parce setoso-pilosi. *Folia* obovato-oblanceolata vel oblongo-oblanceolata, apice obtuse mucronata et triangularia, e medio ad basin obtusum sensim angustata, 4.5–6.5 cm. longa, 1.8–2.5 cm. lata, tenuiter et rigide coriacea, supra opaca et glabra, infra dense lepidota, squamis atrobrunneis spatium diametro suo minus distantibus, epidermide papillosa; costa media supra impressa, infra prominens et leviter lepidota; nervi laterales utrinsecus circiter 6, infra vix prominuli, basales acute ascendentes; petioli 5 mm. longi, supra canaliculati, dense lepidoti. *Inflorescentia* 3-flora, umbellata, axe villoso; pedicelli circiter 3 mm. longi, lepidoti. *Calyx* parvus, circiter 1.5 mm. longus, obscure lobatus, extra lepidotus, eciliatus. *Corolla* parva circiter 4 cm. longa, fere ubique lepidota; tubus lobis paullo brevior; lobi 5, elliptico-rotundati, marginibus undulatis. *Stamina* 10, tubo paullo longiora; filamenta in quadrante inferiore pubescentia; antherae 4 mm. longae. *Ovarium* 5-loculare, dense lepidotum; stylus 3 cm. longus, in dimidio inferiore lepidotus, stigmate circiter 3 mm. lato coronatus. *Capsula* non visa.

31. **Rhododendron carneum,** Hutchinson in Bot. Mag. t. 8634 (1915).

A shrub about 1 m. high; twigs densely brown-lepidote. *Leaves* elliptic-obovate, subacute, base obtuse or slightly cuneate, 5–11 cm. long, 3–4 cm. broad, coriaceous, deep green above, closely reticulate, glabrous, glaucous and lepidote with yellow scales beneath; midrib raised beneath, with 5–8 lateral nerves along each side which are visible on both surfaces, are somewhat curved, and become very slender towards the margin of the leaf; petiole 0.8–1.4 cm. long, densely lepidote. Bud-scales widely ovate, bluntly mucronulate, lepidote outside, densely fringed with soft short white hairs. *Calyx* well-developed, 5-lobed, two segments rounded-ovate, ciliate at the tip with long hairs and densely lepidote outside. *Corolla* flesh-coloured; tube 3.5–4 cm. long, 1 cm. across at the base, 3 cm. across at the mouth, sparingly lepidote outside, glabrous within; lobes spreading, oblong, truncate or rounded, 3 cm. long, 3–3.5 cm. wide. *Stamens* usually 12, unequal, slightly exserted; filaments slender, with spreading hairs in their lower half, up to 4.5 cm. long; anthers 4 mm. long. *Ovary* 6-celled, densely lepidote; style exserted, 6 cm. long, densely lepidote, pink upwards; stigma capitate, brown, viscid, 3 mm. across.

UPPER BURMA. This very beautiful Rhododendron is a native of Northern Burma, where it was met with at an altitude of about 7500 ft. in the Northern Shan States by Major C. W. Browne, of the Survey of India, by whom a supply of seed was sent to Colonel F. B. Longe, Holly Lodge, Thorpe, Norwich. One of the plants raised from these seeds was sent to Kew for determination, and was figured in the Botanical Magazine. According to Colonel Longe, this species in its native country grows on open grassy hillsides away from any large trees, prefers western slopes, and grows to a height of about 3 ft.

In wild specimens the flowers are of a crimson-pink, which gradually turns to a delicate white, or to white suffused with pink.

32. **Rhododendron Johnstoneanum,** Watt, MSS.* *R. formosum,* var. *Johnstonianum,* Brandis, Ind. Trees, 411 (1906).

A rather large bush, much branched; older branches covered with grey shining bark; one-year-old branchlets finely lepidote

* *Rhododendron Johnstoneanum,* Watt, ined.; sp. nov.; affinis *R. Veitchiano,* Hook., sed ramulis annotinis dense setosis, foliorum squamis infra densioribus, corolla rubro suffusa differt.

Frutex multo ramosus; rami vetustiores cortice cinereo nitido obtecti; ramuli annotini minute lepidoti et setoso-pilosi, hornotini setosi sub anthesin jam elongati.

and bristly with hairs; young branchlets already elongating at the time of flowering, bristly. *Leaves* elliptic or slightly obovate-elliptic, a little narrowed to an obtuse base, rounded to an obtuse callous mucro at the apex, 5–10 cm. long, 2–4 cm. broad, rigidly coriaceous, bristly ciliate when young, green on both sides, with reddish nerves when young, densely lepidote but soon becoming glabrous above, lepidote below, the scales very dense and nearly contiguous with a broad fringe, the epidermis minutely papillous between the scales; midrib impressed above, prominent beneath, lepidote; lateral nerves slender, about 8 on each side of the midrib, fairly distinct on the lower surface; petioles 0.5–1.3 cm. long, ciliate, closely lepidote, grooved on the upper side. *Inflorescence* about 4-flowered, the pedicels arising from about the same level; bud-scales broadly rounded and fringed with soft white hairs; pedicels about 1 cm. long, densely lepidote. *Calyx* oblique, very short, not or scarcely lobed, with a dense fringe of long hairs. *Corolla* funnel-shaped, 6 cm. long, white, spotted with red inside the adaxial lobe, which has a yellow blotch at the base on each side; tube flushed with pink outside, lepidote and softly pubescent outside; lobes 5, broadly ovate, a little apiculate, lepidote towards the middle outside. *Stamens* 10, unequal, exserted; filaments pubescent in their lower half; anthers 5 mm. long. *Ovary* 6-celled, lepidote; style rather slender, overtopping the corolla, lepidote in its lower two-thirds, crowned by a disk-like stigma. *Capsule* 6-celled, broad, about 2 cm. long, lepidote (after Watt's drawing).

ASSAM. Manipur: Sirhoifurar, 6000–7500 ft., fls. 11th April 1882, G. Watt, 6401 (type).

This was named in manuscript by Sir George Watt, who sent seeds of the species to Kew in January 1882. The seedlings however, eventually all died off. It is named after Mrs John-

Folia elliptica vel leviter obovato-elliptica, ad basin obtusum paullo angustata, apice rotundata et obtuse calloso-mucronata, 5–10 cm. longa, 2–4 cm. lata, rigide coriacea, juniora setoso-ciliata et nervis rubris, supra dense lepidota sed mox glabra, infra lepidota, squamis densissimis et fere contiguis marginibus latis, epidermide minute papillosa; costa supra impressa, infra prominens, lepidota; nervi laterales graciles, utrinsecus circiter 8, infra satis distincti; petioli 0.5–1.3 cm. longi, ciliati, crebre lepidoti, supra canaliculati. *Inflorescentia* terminalis, circiter 4-flora, pedicellis subumbellatis; squamae gemmarum floriferarum late rotundatae, pilis albidis mollibus marginatae; pedicelli circiter 1 cm. longi, dense lepidoti. *Calyx* obliquus, brevissimus, haud vel vix lobatus, pilis densis longis marginatus. *Corolla* infundibuliformis, 6 cm. longa, alba, intra lobum adaxialem rubro-maculata et utrinque flava; tubus extra roseo suffusus, extra lepidotus et molliter pubescens; lobi 5, late ovati, subapiculati, medium versus extra lepidoti. ***Stamina*** 10, inaequalia, exserta; filamenta in dimidio inferiore pubescentia; antherae 5 mm. longae. *Ovarium* 6-loculare, lepidotum; stylus gracilis, stigmate disciformi coronatus. *Capsula* 6-locularis, circiter 2 cm. longa, lepidota (ex Watt icon.).

stone, the wife of Colonel Johnstone, Political Agent in Manipur in 1882. Judging from Sir G. Watt's notes, the species must be extraordinarily variable. I have therefore described only that specimen (Watt, 6401) which corresponds with the collector's coloured figure in the Kew collection. That there is great variation is shown in Sir George's field notes in the Edinburgh Herbarium, which seem worth reproducing in detail. They are as follows :—

G. Watt, No. 6401 (type) : "Sirhoifurar, 6–7500 ft., April 11th, 1882 ; a largish bush, much branched ; leaves oblong, mucronate on short petioles, which have long black hairs, under-surface coated with brown circular scales ; leaf-buds long, scales with white ciliae ; flower-buds round with scales also having white fringe ; flowers large white with rose-purple flush along midrib of petals especially on outside, sweetly scented ; peduncles $\frac{1}{4}$–$\frac{1}{2}$ in. long, scarlet with white spots ; calyx reduced to a ring having a fringe of long white hairs ; corolla 2 in. long by 3 in diameter, wide gaping, upper and odd petal with a yellow mark at sinus on either side and in middle and within tube spotted orange-red into streaks ; others all pure white with a purple flush on outside ; style yellow, subglandularly spotted ; stigma corrugated."

G. Watt, No. 5961 : "On the grassy summit of Seripharai, 10–11,000 ft., Jan. 17, 1882 ; a small bush much branched at its extremities ; leaves elliptic when young covered with curious circular scales which on dehiscing leave brownish pits all over the under surface and petiole ; when young also ciliate but when mature with hairs on petiole only about 2 in. long and on brow petiole $\frac{1}{4}$ inch ; flower-buds globular with broad ovate acuminate scales having a fringe of pure white hairs ; fruits 6-angled with only partial dehiscence, tubercled ; seeds sent to Kew Jan. 31st, 1882."

G. Watt, No. 6213 : "Summit of Japvo, 10,000 ft., March 9th, 1882 ; a small distorted plant, seems same as species collected on Shiruriphari ; leaves dotted, petiole and margin with long straggling hairs."

G. Watt, No. 6402 : "Sirohifurar, 6–7500 ft., April 11th, 1882 ; same species as preceding only a yellowish-white variety with no trace of rose-pink and smaller less hairy leaves ; flowers quite yellow in bud whereas former are rose-coloured ; young leaves of both sweetly scented and pale moss green."

G. Watt, No. 6475 : "Summit of Sirohifurar, 8000 ft., April 12th, 1882 ; not in flower at higher points, all in flower-bud ; flowering freely at 7000 feet along the margins of forests where grassy slopes commence ; leaf-buds small, slim, erect, 1 inch long ; leaves large, ovate, erect, leaves in flowering plants

drooping, 2–4 on extremities of twigs; young leaves pale moss green, soft, sweetly scented, hairy when a little older, horizontal with hairs on margin and petiole, also extremity of twig black-woolly."

G. Watt, No. 6701: "Keyang, 3rd Peak N.E. of Ching Sow, 9000 ft., April 22nd, 1882; common on summit, pink and white varieties both."

G. Watt, No. 6881: "Japvo, 9800 ft., May 15th, 1882; a small bush; leaves when young hairy but glabrous when old; flowers white, yellow dotted on outside, side gaping, sweetly scented; calyx a small green ring; ? same as Sirohifurar plant; flowers smaller, more gaping, always white, leaves quite glabrous except when young and calyx glabrous; if same, it is the yellow variety which I now regard as worthy of a name."

33. **Rhododendron inaequale,** Hutchinson, n. sp.*
R. formosum, var. *inaequalis*, C. B. Clarke in Hook. f. Fl. Brit. Ind. iii. 473 (1882).

A shrub 1–2 m. high; branches more or less umbellate, the older ones stout, covered with grey bark; one-year-old branchlets sparingly lepidote, sometimes also a little strigose towards the top; young branchlets lepidote and sparingly strigose-pubescent; axillary leaf-bearing buds very small, and quite dormant at the time of flowering. *Leaves* lanceolate or elliptic-oblanceolate, acuminate to an obtuse mucronate apex, acute or subacute at the base, 6–12 cm. long, 1.5–4 cm. broad, rather rigidly coriaceous, at first a little scaly on the upper surface, soon becoming quite glabrous and reticulate, lepidote below, the scales slightly unequal in size and 2–3 times their own diameter apart, the epidermis between the scales fairly densely papillous; midrib impressed above, prominent below, minutely lepidote; lateral nerves about 6–8 on each side of the midrib,

* *Rhododendron inaequale*, Hutchinson, sp. nov.; affinis *R. formoso*, Wall., capsula longiore basi valde obliqua differt.

Frutex 1–2 m. altus; rami plus minusve umbellati, vetustiores robusti, cortice cinereo obtecti, annotini parce lepidoti, interdum etiam apicem versus parce strigosi, hornotini lepidoti et strigoso-pubescentes; gemmae foliiferae axillares sub anthesin minimae haud productae. *Folia* lanceolata vel elliptico-oblanceolata, ad apicem obtusum mucronatum acuminata, basi acuta vel subacuta, 6–12 cm. longa, 1.5–4 cm. lata, rigide coriacea, supra primum parce lepidota, mox glabra et reticulata, infra lepidota, squamis leviter inaequalibus spatium diametro suo duplo vel triplo majus distantibus, epidermide inter squamas subdense papillosa; costa supra impressa, infra prominens, minute lepidota; nervi laterales utrinsecus 6–8, a costa media sub angulo 45°–65° abeuntes, infra graciles et leviter prominentes; petioli 1–1.5 cm. longi, punctato-lepidoti, supra canaliculati. *Inflorescentia* terminalis, circiter 6-flora, pedicellis subumbellatis; gemmae floriferae ovoideo-globosae, circiter 2 cm. longae, squamis late rotundatis apiculatis coriaceis extra medium versus lepidotis, pilis mollibus albis marginatae;

diverging from it at an angle of 45°–65°, slender and slightly prominent on the lower surface; petioles 1–1.5 cm. long, punctate-lepidote, grooved on the upper surface. *Inflorescence* about 6-flowered, the pedicels arising from approximately the same level; flower-bearing buds ovoid-globose, about 2 cm. long, the scales broadly rounded, apiculate, leathery, lepidote towards the middle outside and fringed with short soft white hairs; pedicels 1–1.5 cm. long, lepidote. *Calyx* very oblique, saucer-shaped, about 2 mm. long, undulately lobed, lepidote outside. *Corolla* seen only in a withered condition, laxly scaly all over the outside. *Stamens* probably 10; filaments rather densely pubescent in the lower third; anthers 2.5 mm. long. *Ovary* 6-celled, oblique, about 1 cm. long, ribbed, closely lepidote; style very long, persistent in fruit, 7–8 cm. long, laxly lepidote in the lower half, crowned by a deeply rugose-lobulate stigma. *Capsule* 6-valved, very oblique, about 3 cm. long, densely lepidote, the style persisting for some time on the central axis.

ASSAM. Khasia Hills; summit of Kollong Rock, 1835, Griffith, 978. Kollong Rock, 5000 ft., 8th July, 23rd October 1850, fr., J. D. Hooker and T. Thomson. Kollong, 6000 ft., shrub 3 ft., 23rd August 1885, fr., C. B. Clarke, 40025. Kollong, 5600 ft., 24th May 1886, bush 6 ft., withered fls. and young fr., C. B. Clarke, 43985A. Shillong, 4000 ft., 28th July 1886, fr., C. B. Clarke, 44324.

For remarks on the habitat of this species see p. 15.

34. **Rhododendron Veitchianum,** Hook. Bot. Mag. t. 4992 (1857); Millais, Rhododendrons, 257 (1917). *R. formosum,* Kurz, For. Fl. Brit. Burma, ii. 94 (1877), non Wall. *R. formosum,* var. *Veitchianum,* Kurz in Journ. As. Soc. 1877, ii. 216; Hosseus in Beihefte Bot. Centralbl. xxvii. 505 (1910).

A shrub 2.75 m. high or more growing on rocks or epiphytic on trees; older branches covered with loose crustaceous bark; one-year-old branchlets finely lepidote, apparently not setose; axillary leaf-bearing buds very small and still dormant or just

pedicelli 1–1.5 cm. longi, lepidoti. *Calyx* valde obliquus, patelliformis, circiter 2 mm. longus, undulate lobatus, extra lepidotus. *Corolla* in statu marcido tantum visa, extra ubique laxe lepidota. *Stamina* probabiliter 10; filamenta in triente inferiore subdense pubescentia; antherae 2.5 mm. longae. *Ovarium* 6-loculare, obliquum, circiter 1 cm. longum, costatum, crebre lepidotum; stylus longissimus, in fructu persistens, 7–8 cm. longus, in dimidio inferiore lepidotus, stigmate profunde rugoso-lobulato coronatus. *Capsula* valde obliqua, circiter 3 cm. longa, dense lepidota, axe centrali stylo persistente ad breve tempus coronato.

beginning to develop at the time of flowering, the scales leathery and obtusely apiculate. *Leaves* obovate-oblanceolate or elliptic-obovate, narrowed to the base, obtusely triangular-acuminate at the apex, 5–10 cm. long, 2–4 cm. broad, coriaceous, lepidote above when young, soon glabrescent and a little reticulate, glabrous below and lepidote, the scales rather unequal and from 1–1½ times their own diameter apart, rusty-brown, fringed with a narrow membranous collar, the epidermis closely papillous below; midrib impressed above, prominent below, laxly lepidote; lateral nerves about 6 on each side of the midrib, slender, arcuate, slightly raised below; petiole 0.5–1 cm. long, closely lepidote, with a narrow groove on the upper side. *Inflorescence* up to 5-flowered, the pedicels arising from approximately the same level; flower-bearing buds ovoid, subacute, 2 cm. long, the scales broadly ovate or rounded, apiculate, leathery, closely lepidote outside and densely fringed with soft short hairs; scars of the fallen bud-scales in about 8 rows, straw-coloured; pedicels 5–7 mm. long, lepidote. *Calyx* rather variable, unequally lobed, up to 2 mm. long, the lobes broad and frequently with a few (3 or 4) long slender hairs on the margin, lepidote outside especially towards the base. *Corolla* 6–7 cm. long, white inside, slightly tinged outside with green; tube widely funnel-shaped, a little longer than the lobes, lepidote mainly on the dorsal (adaxial) side, often softly pubescent towards the base; lobes 5, spreading, with strongly crinkled undulate margins, very sparingly scaly outside towards the middle. *Stamens* 10, unequal, nearly twice as long as the corolla tube; filaments pubescent towards the base; anthers 4-5 mm. long. *Ovary* 5-celled, densely lepidote; style longer than the corolla, lepidote in the lower half, crowned by a deeply lobulate disk-like stigma. *Capsule* straight, 3 cm. long, about 1.3 cm. thick, rugose-lepidote.

BURMA. Central Burma: Tiddim, Chin Hills, 6000 ft., April 1916, V. H. T. Fields Clarke, 35 (Herb. Edinb.). Southern Shan States: Lakat Taung, Molye, 5000 ft., in open scrub forests, epiphytic, fls. white, 25th February 1910, W. A. Robertson, 130. Moolee-it, 7000 ft., 7–8 ft. high or more, sometimes epiphytical on trees, Parish, 418, 419. Expedition to Nat-toung, Parish. Lower Burma: Mulegit and below Dawna Range, 6000 ft., fls. 27th January 1912 (seen also on the Ta-u plateau near the Lampa Chaung down to 2500 ft.), J. H. Lace, 5632. Tenasserim: a shrub on rocks (never in ground) at 6000 ft., epiphytic on tall tree, at 4000 ft., fls. white, lower petal deep yellow, Col. Beddome, 105. Without definite locality, Lobb.

SIAM. Doi Sootep, 4800–4920 ft., fls. white, 12th Decem-

ber 1904, C. C. Hosseus, 201 ; 4500–5500 ft., epiphytic, growing into a spreading shrub about 12 ft. high, common in evergreen jungle near the top of Doi Sootep, 2nd January 1909, A. F. G. Kerr, 512 ; fr. 14th April 1909, A. F. G. Kerr, 512.

Rhododendron Veitchianum is a fine species inhabiting the warmer parts of Burma and in Siam. It was first imported from Moulmain by the Veitchian firm of Exeter, after whom it was named by Hooker in the Botanical Magazine. The plant figured in the magazine was exhibited at the Horticultural Society's meeting in London on the 6th May 1857. There is no specimen of this particular plant in the dried collections at Kew.

It is not always easy to distinguish *R. Veitchianum* from broad-leaved examples of *R. formosum*, Wall. The latter, however, has nearly always some long hairs on the petioles, leaf margins, and on the one-year-old leafy shoots, characters which appear to be lacking from *R. Veitchianum* ; the latter too has a much larger fruit than has *R. formosum*. Then *R. Veitchianum* seems confined to Central and Lower Burma and Siam, whilst *R. formosum* is so far known only from the Khasia Hills, Assam.

35. **Rhododendron Cubittii,** Hutchinson, n. sp.*

Habit ? One-year-old branchlets covered with pale almost elepidote bark, about 4 mm. thick ; young branchlets purplish-

* *Rhododendron Cubittii*, Hutchinson, sp. nov. ; affinis *R. Veitchiano*, Hook., sed ramulis junioribus et foliis et petiolis setoso-ciliatis, foliis elongato-oblongo-ellipticis differt.

Ramuli annotini cortice pallido fere elepidoto obtecti, circiter 4 mm. crassi, juniores purpureo-brunnei, parce lepidoti, pilis rigidis paucis muniti ; gemmae foliiferae axillares sub anthesin jam elongatae, squamis subpersistentibus inferioribus ovatis minute ciliolatis extra inconspicue lepidotis, superioribus subspatulatis et tenuioribus basin versus pilis longis marginatis apicibus molliter et dense ciliolatis. *Folia* elongato-oblongo-elliptica, basi obtusa, ad apicem longe mucronatum sensim attenuata, 10–11 cm. longa, 3–3.5 cm. lata, rigide sed subtenuiter coriacea, juniora supra laxe lepidota, mox fere glabra et reticulata, infra glauca et lepidota, squamis leviter inaequalibus spatium diametro suo paullo majus distantibus, epidermide crebre papillosa ; costa media supra anguste impressa, infra subprominens, parce lepidota ; nervi laterales utrinsecus circiter 8, infra inconspicui ; petioli 1–2 cm. longi, supra canaliculati, pilis rigidis paucis ciliati, punctato-lepidoti. *Inflorescentia* biflora ; gemmae floriferae non visae ; pedicelli 5 mm. longi, robusti, squamis flavidis dense lepidoti. *Calyx* obliquus, in latere dorsali 3 mm. longus, undulate lobatus, extra dense lepidotus, eciliatus. *Corolla* circiter 7 cm. longa, 5-lobata, sublate infundibuliformis ; tubus usque ad 4 cm. longus, in latere dorsali lepidotus, basin versus molliter pubescens ; lobi margine undulati, extra laxe lepidoti. *Stamina* 10, corollae fere aequilonga ; filamenta inferne pubescentia ; antherae 5 mm. longae. *Ovarium* 6-loculare, 6 mm. longum, in stylum abrupte contractum, dense lepidotum ; stylus staminibus leviter longior, in triente inferiore laxe lepidotus, stigmate disciformi lobulato coronatus. ***Capsula* non visa.**

brown, sparingly lepidote, with a few long stiff hairs; axillary leaf-bearing buds already elongated at the time of flowering, scale-leaves subpersistent, the lowermost ovate and very minutely ciliolate, inconspicuously lepidote outside near the middle, the upper ones more spathulate and thinner and fringed with long hairs towards the base, the tips softly and densely ciliolate. *Leaves* elongate-oblong-elliptic, obtuse at the base, gradually narrowed to a rather long mucronate apex, 10–11 cm. long, 3–3.5 cm. broad, rigidly but rather thinly coriaceous, loosely lepidote above when quite young, soon becoming nearly glabrous and reticulate, probably somewhat glaucous below and lepidote, the scales slightly more than their own diameter apart, somewhat unequal, the epidermis between the scales closely papillous; midrib narrowly impressed above, fairly prominent below, sparingly lepidote; lateral nerves about 8 on each side of the midrib, faint below; petioles 1–2 cm. long, grooved above, and with a few long stiff hairs on the margin, punctate-lepidote. *Inflorescence* 2-flowered; flowering buds not seen; pedicels 5 mm. long, stout, densely lepidote with yellowish scales. *Calyx* oblique, about 3 mm. long on the dorsal (adaxial) side, undulately lobed, densely lepidote outside, apparently not ciliate. *Corolla* (colour ?) about 7 cm. long, 5-lobed, fairly widely funnel-shaped; tube up to 4 cm. long, lepidote only on the dorsal (adaxial) side, softly pubescent towards the base; lobes with undulate margins, laxly lepidote outside. *Stamens* 10, nearly as long as the corolla; filaments pubescent in their lower part; anthers 5 mm. long. *Ovary* 6-celled, 6 mm. long, abruptly contracted into the style, densely lepidote; style slightly longer than the stamens, rather laxly scaly in the lowermost $\frac{1}{3}$ of its length, crowned by a discoid lobulate stigma. *Capsule* not known.

NORTH BURMA. Bhamo Division: Maru-kahtaung (Sindum), 5500 ft., March 1909, G. E. S. Cubitt, 385 (Herb. Edinb.).

The above description has been drawn up from the single flowering specimen quoted. The species may be regarded as a northern outlier of *R. Veitchianum*, Hook., and in many respects it is intermediate between that species and *R. formosum*, Wall., from the Khasia Hills. It has the bristly shoots, leaf margins, and petioles of *R. formosum*, and flowers like *R. Veitchianum*. The elongated leaves are not at all obovate as in both the other species.

36. **Rhododendron formosum,** Wallich, Plant. Asiat. Rar., iii. 3, t. 207 (1832); G. Don, Gen. Syst. iii. 845 (1834); DC. Prodr. vii. 721 (1839); Bot. Mag. t. 4457 (1849); C. B. Clarke in Hook. f. Fl. Brit. Ind. iii. 473 (1882); Millais, Rhododendrons, 168 (1917), excl. var. *Johnstoneanum*. *R. Gibsonii*, Paxton, Mag. of Bot. viii. t. 217 (1841); Fl. des Serres, i. t. 18 (1845).

A much branched shrub; branches spreading, leafy, shining, the younger parts finely lepidote. *Leaves* crowded, very variable, oblanceolate to obovate, usually subacute or acute-acuminate at the apex, mucronate, gradually narrowed to the base, 3–7 cm. long, 1–3 cm. broad, papery or thinly coriaceous, laxly lepidote above when young, soon becoming glabrous or nearly so, fringed with long white hairs on the margin especially when young (sometimes not fringed), more densely lepidote and glabrous beneath, the scales 1–1½ times their own diameter apart, reddish-brown, and slightly unequal in size, the epidermis densely covered with short rod-like papillae; midrib impressed above, prominent beneath, rather sparingly lepidote; lateral nerves mostly scarcely visible, 6–8 on each side of the midrib; petiole 5–8 mm. long, lepidote, grooved above, often fringed with long hairs. *Inflorescence* 2–3-flowered, the pedicels arising from about the same level; flower-bearing buds narrowly ellipsoid, acute, the outer scales gradually changing into leaves, acuminate, a little lepidote on the back, fringed with soft short hairs; pedicels up to 1.3 cm. long, rather densely scaly. *Calyx* very small, undulate, densely lepidote outside, occasionally with one or two long hairs on the margin. *Corolla* white, tinged with yellow and rose, with 5 external red stripes, funnel-shaped, about 6 cm. long; tube about as long as the lobes, lepidote outside, softly pubescent towards the base; lobes 5, broadly ovate, rounded at the apex, about 2.5 cm. long and broad. *Stamens* 10, unequal in length, ¾–1½ times as long as the tube; filaments densely pubescent in their lower half; anthers 5 mm. long. *Disk* tomentose. *Ovary* 6-celled, about 5 mm. long, densely lepidote; style as long as or longer than the corolla, lepidote in the lower half or three-quarters, rather slender, crowned with a broad capitate stigma. *Capsule* straight, 1.5–2 cm. long, about 8 mm. thick, strongly ribbed, densely lepidote. *Seeds* brown, 2 mm. long, sharply pointed at one end.

ASSAM. Khasia Hills; without precise locality, Smith (fide Wallich, l.c.), type. Between Moflong and Myrung, 9th November 1835, fls., Griffith (Kew Distrib., No. 3506); towards Kala Panee, 3rd November 1835, fr., Griffith, 770 (Kew Distrib.,

No. 3506). Kala Panee, 5000 ft., 27th June, 5th August, 28th October 1850, fr., J. D. Hooker and T. Thomson. Boja-Panee, 5000 ft., 29th June 1850, spec. sterile, J. D. Hooker and T. Thomson. Boja-Panee, 5000 ft., 27th October 1850, J. D. Hooker and T. Thomson. Pomrang, 4000 ft., 16th September 1850, fls., J. D. Hooker and T. Thomson. Bor-Panee, Simons, 10. Lailankote, 5500 ft., 26th September 1886, fr., C. B. Clarke, 45563.

For further notes on this species and its varieties described in the Flora of British India see p. 14.

G. Don (l.c.) gives Nepal as the habitat of *R. formosum*, but this is obviously a mistake. There are always 6 cells in the ovary and not 10 as stated by Don; perhaps he assumed there were 10 cells from Wallich having described the ovary as being "10-furrowed."

Kurz (For. Fl. Burma, ii. 94) records *R. formosum* from Martaban, but his description seems to indicate a mixture of *R. formosum* and *R. Veitchianum*. I have seen only the latter species from this region, and it is extremely unlikely that *R. formosum* should occur there, as we know it only from the Khasia Hills.

R. formosum is a favourite greenhouse shrub, with deliciously scented flowers. According to Millais (l.c.) it grows well and flowers freely out of doors in Cornwall, the West of Scotland, and in Guernsey, but does best even in those mild climates when given the shelter of a wall. There is a beautiful drawing by Fitch in the Botanical Magazine at t. 4457.

37. **Rhododendron burmanicum**, Hutchinson in Kew Bull. 1914, 185.

A branched shrub; one-year-old branchlets elongated, rusty-brown, lepidote, very densely so towards the top and strigose pilose here and there. *Leaves* crowded, numerous, oblanceolate to obovate, more or less shortly triangular at the apex with a knob-like mucro, cuneate at the base, 6–8 cm. long, 1.75–4 cm. broad, subcoriaceous, densely lepidote on both surfaces, the younger ones thinly ciliate especially towards the base, the scales both above and below much less than their own diameter apart, sometimes contiguous or slightly overlapping, with a few larger ones scattered here and there, the epidermis shortly papillous between the scales; midrib impressed above, prominent below, lepidote; lateral nerves 9–11 on each side of the midrib, diverging from it at an angle of 45° or more, arcuate, slender, slightly prominent below; petioles stout, 0.5–1 cm. long, grooved above, about 3 mm. thick, densely brown-lepidote, ciliate. *Inflorescence* terminal, 5–6-

flowered; outer bud-scales broadly ovate, long-caudate acuminate, submembranous, densely lepidote outside, long-ciliate, the inner ones suborbicular, mucronate, villous with white hairs on the margin, sparingly lepidote outside; pedicels 0.5–2 cm. long, arising from about the same point, slender, about 1 mm. thick, lepidote. *Calyx* very small, long-pilose-ciliate. *Corolla* sweet-scented, greenish-white or yellowish, narrowly funnel-shaped, about 4.5–5 cm. long, lepidote all over the outside; tube 3 cm. long, slightly pubescent towards the base outside; lobes 5, ovate-rounded, about 2 cm. long and broad. *Stamens* 10, slightly exserted; filaments white-villous in the lower part; anthers 4–5 mm. long. *Disk* fleshy, lobulate. *Ovary* 6-celled, oblong, densely lepidote; style early exserted, 4 cm. long, sparingly lepidote in the lower half, crowned by a stigma about 3 mm. in diameter.

SOUTH-WEST BURMA. Mt. Victoria, Lady Wheeler Cuffe (originally described from a plant grown in the Glasnevin Botanic Gardens, Dublin).

38. **Rhododendron pachypodum,** Balf. f. et W. W. Smith in Notes, Roy. Bot. Gard. Edinb. ix. 254 (1916).

A shrub 1.5 m. high; older branchlets covered with smooth grey bark; one-year-old branchlets reddish-brown, lepidote; young branchlets clothed towards the base with the briefly persistent scale leaves, densely lepidote; axillary buds probably fairly well advanced at the time of flowering, the scales ovate acuminate, lepidote outside, keeled, the inner ones fringed with soft white hairs. *Leaves* oblanceolate or elliptic-oblanceolate, long and obtusely triangular-acuminate at the apex, gradually narrowed to the base, up to 10 cm. long and 3.5 cm. broad, rigidly coriaceous, sparingly lepidote above or at length glabrous, reticulate, very densely lepidote and glaucous beneath, the scales rather small and about half their own diameter apart, reddish-brown, the epidermis between the scales densely papillous; midrib impressed above, prominent beneath, straw-coloured and lepidote, thick and broad towards the base; lateral nerves slender and distinct below, a little flexuous, about 6–7 on each side of the midrib; petiole 0.5–1 cm. long, lepidote, grooved above, occasionally with a few weak hairs on each side when young. *Inflorescence* about 3-flowered or less; pedicels about 1 cm. long, stout, wrinkled and densely lepidote. *Calyx* oblique, with 5 more or less triangular lobes about 2 mm. long, lepidote outside, and fringed with hairs. *Corolla* yellow (Forrest), all over the outside, about 3–5 cm. long; tube minutely pubescent towards the base outside;

lobes 5, oblong-rounded, about 1.5 cm. long. *Stamens* 10, included; filaments pubescent in the lower half; anthers 4 mm. long. *Ovary* 6-celled, densely lepidote; style about 2.5 cm. long, at length about 5 cm. long in nearly mature fruit, lepidote in its lower $\frac{2}{3}$ crowned by a fist-like lobulate stigma. *Capsule* oblique at the base, 2 cm. long, 6-ribbed, densely covered with golden scales.

W. YUNNAN. Western flank of the Tali Range, lat. 25° 40′ N., open stony pasture and amongst scrub, 9000–10,000 ft.; shrub 2–5 ft., in fruit August 1913, G. Forrest, 11547 (Herb. Edinb.). Tali Range, side valleys, lat. 25° 40′ N., in open scrub, 10,000 ft., shrub 3–4 ft., fls. yellow, August 1914, G. Forrest, 13512 (Herb. Edinb.).

This is a yellow-flowered species very close indeed to my *R. carneum*, which has flesh-coloured flowers. The calyx lobes of *R. carneum* are perhaps much more rounded than in *R. pachypodum*; the material of both species is, however, as yet very inadequate.

39. **Rhododendron iteaphyllum,** Hutchinson, n. sp.* *R. formosum*, var. *salicifolium*, C. B. Clarke in Hook. f. Fl. Brit. Ind. iii. 473 (1882), non *R. salicifolium*, Becc. (1878).

An erect shrub up to 2 m. high; branchlets rather densely leafy, the one-year-old ones rather densely lepidote and sparingly setose-pilose. *Leaves* linear or linear-oblanceolate, narrowed to an acute base, subacutely triangular at the apex, 5–9 cm. long, 0.7–1.5 cm. broad, chartaceous, slightly ciliate when

* *Rhododendron iteaphyllum*, Hutchinson, sp. nov.; affinis *R. formoso*, Wall., sed foliis linearibus vel lineari-oblanceolatis 0.7–1.5 cm. latis differt.

Frutex erectus usque 2 m. altus; ramuli dense foliati, annotini dense lepidoti et parce setoso-pilosi. *Folia* linearia vel lineari-lanceolata, ad basin acutum angustata, apice subacute triangularia, 5–9 cm. longa, 0.7–1.5 cm. lata, chartacea, juniora leviter ciliata demum eciliata, parce lepidota et interdum supra parce setosa, infra lepidota, squamis circiter diametrum suum vel paulo minus distantibus, epidermide inter squamas crebre papillosa; costa supra leviter impressa, infra prominens et parce lepidota, basi circiter 1 mm. lata; nervi laterales vix evoluti, utrinsecus 8–10; petioli 0.5–1 cm. longi, lamina decurrente, anguste alati, ciliati, supra profunde canaliculati, lepidoti. *Inflorescentia* terminalis, umbellatim circiter 3-flora; squamae gemmarum floriferarum apicem versus extra molliter et breviter pubescentes, elepidotae, pilis brevibus marginatae; pedicelli circiter 6 mm. longi, subdense lepidoti. *Calyx* minimus, elobatus, circiter 0.5 mm. longus, extra lepidotus. *Corolla* e basi late infundibuliformis, circiter 5–6 cm. longa, extra ubique parce lepidota; tubus circiter 3.5–4 cm. longus, extra non pubescens; lobi 5, rotundati, medium versus lepidoti. *Stamina* 10, paullo exserta; filamenta inferne dense pubescentia; antherae 4.5 mm. longae. *Ovarium* 6-loculare, dense lepidotum; stylus in dimidio inferiore parce lepidotus, corollam paullo superans, gracilis, stigmate magno lobulato coronatus. *Capsula* recta, 1.6 cm. longa, axi centrali styli basi persistente coronato. *Semina* brunnea, 2 mm. longa, apice caudata.

young, at length eciliate, sparingly lepidote and sometimes a little bristly on the upper surface, lepidote below, the scales about their own or less than their own diameter apart, closely papillous between the scales; midrib slightly impressed above, prominent and sparingly lepidote below, about 1 mm. broad at the base, gradually tapered to the apex; lateral nerves scarcely evident, about 8–10 on each side of the midrib; petioles 0.5–1 cm. long, winged with the decurrent leaf blade, ciliate, deeply grooved on the upper side, lepidote. *Inflorescence* terminal, about 3-flowered, the pedicels arising from the same level; flower bud-scales softly and shortly pubescent outside towards the apex, not lepidote, fringed with short hairs; pedicels about 6 mm. long, rather densely lepidote. *Calyx* very small and not lobed, about 0.5 mm. long, lepidote outside. *Corolla* rather widely funnel-shaped from the base, about 5–6 cm. long, sparingly lepidote all over the outer surface; tube about 3.5–4 cm. long, not hairy outside; lobes rounded, lepidote towards the middle. *Stamens* 10, a little exserted; filaments densely pubescent in the lower half; anthers 4.5 mm. long. *Ovary* 6-celled, densely lepidote; style sparingly lepidote in the lower half, a little longer than the corolla, slender, crowned by a large lobulate stigma. *Capsule* straight, 1.6 cm. long, the central axis tipped with the persistent base of the style. *Seeds* brown, 2 mm. long, tailed at one end.

ASSAM. Khasia Hills: rocks of Bor-Panee, 2000 ft., 24th July 1850, erect bush 6 ft. high, fr. 2nd October 1850, J. D. Hooker and T. Thomson. Along the stream at the same place, fls., Simons. Without definite locality, T. Lobb, No. 3; G. Mann.

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NEW SPECIES OF RHODODENDRON.

BY

PROFESSOR BAYLEY BALFOUR, F.R.S.

IV.

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4123 **Rhododendron aemulorum,** Balf. f.* (Haematodes.)

A much-branched shrub or small tree attaining 4 m. in height. Branches stout, those a year old some 6 mm. in diameter, enwrapped in a grey or cinnamon-grey bistrate dense tomentose indumentum about 1 mm. thick, the rosette-hairs of the lower stratum uncoloured of many narrow pointed branches on short stalks, hairs of the upper stratum long cinnamon-tinted with stout many-celled stalk and many ascending besom-clustered thin pointed interlocking branches, the tomentum more or less persistent until decortication after some years. Foliage-buds unknown. Leaves petiolate as much as 15 cm. long; lamina very thick leathery stiff obovate as much as 13 cm. long 8 cm. broad, apex rounded somewhat truncate or retuse with a short stout mucro, margin cartilaginous plane, base obtuse; upper surface dark green rough rugulose and with punctulations from bases of fallen hairs, the midrib raised at base becoming grooved upwards, the primary veins about 12 on each side grooved as are the smaller veins the intermediate surface being raised, glabrous except the midrib and primary veins which are more or less floccose with cinnamon-coloured or grey hairs; under surface cinnamon-brown covered with a dense woolly bistrate tomentum one millimeter or more thick the hairs like those of the stem, midrib more or less prominent and like the rest of venation which is hidden covered by the tomentum; petiole stout about 2.5 cm. long 5 mm. in diameter enwrapped like the stem in tomentum. Flowers in a terminal about 14-flowered compact umbel the rhachis about 1 cm. long densely woolly, the wool orange-coloured; fertile bracts membranous obovate-oblong about 3 cm. long 1 cm. broad orange-coloured silkily

* *Rhododendron aemulorum*, Balf. f.—Frutex multiramosus ad 4 m. altus. Rami crassi tomento cinnamomeo dense lanati. Folia petiolata crasse coriacea circ. 15 cm. longa; lamina obovata circ. 13 cm. longa 8 cm. lata apice rotundata saepe emarginata mucronata, basi obtusa; supra rugulosa, costa media floccosa maturitate glabra; subtus cinnamomeo-tomentosa, tomento denso bistrato induta; petiolus crassus tomento pallido denso. Umbella breviter racemosa circ. 14-flora, rhachi lanata; bracteae membranaceae circ. 3 cm. longae obovato-oblongae utrinque sericeae; bracteolae lineares pedicellis breviores pilo-cristatae; pedicelli decurvati circ. 1.3 cm. longi dense lanati. Calyx obsoletus vel brevissime 5-dentatus lanato-tomentosus. Corolla tubuloso-campanulata postice convexa kermesina maculata circ. 4 cm. longa utrinque glabra 5-lobata; lobi late bilobulati. Stamina 10 corolla gynaeceoque breviora; filamenta glabra. Discus glaber. Gynaeceum corolla paullo brevius; ovarium conoideum circ. 7 mm. longum dense tomentosum; stylus glaber.

hairy outside and towards top inside, finely ciliate at margin; bracteoles narrow linear silkily hairy outside with a long hair crest, about 8 mm. long shorter than pedicels; pedicel stout about 1.3 cm. long densely woolly with orange-yellow hairs, decurved seton very obliquely to the calyx. Calyx obsolete showing 5 minute woolly teeth. Corolla fleshy tubular-campanulate somewhat oblique with a convex posterior side dark crimson darker spotted on all the petals about 4 cm. long glabrous inside and outside; tube shallowly pouched at the base with dark glandular surface in the pouches inside, the posterior larger; limb 5-lobed; lobes short and broad about 1.5 cm. long 2.5 cm. broad, rounded slightly crenulate bilobed. Stamens 10 unequal shorter than corolla and gynaeceum, longest about 3 cm. long with anther 2.5 mm. long, shortest about 2 cm. long with anther 2 mm. long; filaments red glabrous hardly expanded downwards; anthers dark black-purple. Disk dark-purple glabrous. Gynaeceum about 3.5 cm. long shorter than corolla; ovary conoid about 7 mm. long grooved truncate densely woolly like the pedicels; style glabrous hardly dilated under the small lobulate discoid stigma to which it forms a lip.

W. Yunnan. Eastern flank of the N'Maikha-Salween divide. Lat. 26° N. Alt. 11,000 ft. Shrub of 6–8 ft. Flowers very deep crimson. On open rocky slopes and the margins of thickets. G. Forrest. No. **17,853.** April 1919.

W. Yunnan. N'Maikha-Salween divide. Lat. 26° 40′ N. Alt. 11,000 ft. Duplicate in immature fruit of No. **17,853.** G. Forrest. No. **17,995.** June 1919.

W. Yunnan. Same habitat and locality as No. **17,853,** of which it is duplicate in fruit. G. Forrest. No. **18,354.** July 1919.

N.E. Upper Burma. Hpimaw Pass. Alt. 10,000 ft. Just in bloom on the southerly-facing dip of the Hpimaw Pass, on both sides of which it abounds amid the small bamboo-brake. A dwarfish many-branched thin tree of 15 feet, with brown-felted leaves, and rather waxy flowers of intense scarlet-crimson, without scent. Farrer. No. **815.** April 11, 1919.

A species of the Haematodes series and a very distinct one. At sight its rugose very thick leaves with bright-coloured underleaf tomentum and the bilobed lobes of the 5-lobed corolla simulating a 10-lobed one might suggest the Falconeri series. But it has no near relationship to that series. From *Rh. haematodes*, Franch., a plant of the Tali Range in Yunnan, the rich-coloured indumentum of the larger leaves suffices to separate it. *Rh. chactomallum*, Balf. f. et Forrest, from far North in S.E. Tibet, has leaves almost as large, but they are much thinner with a thinner brownish-buff indumentum and

the stems have an indumentum more or less setulose in the upper stratum.

4124 **Rhododendron agglutinatum,** Balf. f. et Forrest.*

Shrub barely 2 m. high with stout branches showing short annual growths. Branches a year old greenish-yellow glabrous or with a withered greyish patchy trace of juvenile hairs and glands, as much as 4 mm. in diameter. Foliage-buds ovoid pointed; outer scale-leaves rotundate cucullate leathery with thinner margin keeled and mucronate puberulous on back prominently silky inside the margin ciliate with sebaceous hairs very numerous around the mucro, transition-forms more oval, innermost which are carried up on elongating shoot are more or less membranous yellow elongated spathulate pointed and mucronate as much as 2.5 cm. long 8 mm. broad ciliate with sebaceous hairs; young leaves revolute covered on both sides like the young stems with large orange-coloured glands mixed with long branched wide-celled hairs, the hairs fewer and glands more numerous on upper than on under side. Leaves petiolate as much as 10 cm. long; lamina leathery oblong-oval or oblong sometimes a little broader above the middle as much as 8.5 cm. long 3.5 cm. broad, apex obtuse or somewhat acute sometimes almost rounded with a red short mucro, margin cartila-

* *Rhododendron agglutinatum,* Balf. f. et Forrest.—Frutex vix 2 m. altus ramis crassis. Rami annotini viridi-flavi glabri vel indumenti juvenilis vestigiis conspersi circ. 4 mm. diam. Alabastra ovoidea acuta; perulae extimae coriaceae rotundatae mucronulatae nunc subcaudatae utrinque puberulae; intimae submembranaceae oblongo-spathulatae ad 2.5 cm. longae 8 mm. latae sebaceo-ciliatae; folia juvenilia revoluta utrinque dense glandulosa et floccosa. Folia petiolata ad 10 cm. longa; lamina coriacea oblongo-ovalis vel oblonga semel subobovalis ad 8.5 cm. longa 3.5 cm. lata obtusa vel subacuta vel subrotundata breviter mucronata margine paullo recurva cartilaginea, basi subtrunculata vel cordulata; supra atro-olivacea nunc rubida glabra (costa media indumenti juvenilis vestigiis conspersa) in morem squali corii rugulosa, costa media rubra sulcata, venis primariis utrinsecus circ. 15 rubris leviter sulcatis; subtus atro-fulva ubique indumenti pellicula laevi agglutinata pilorum glandularumque vestita, costa media elevata, laete flava (ubi nudata); petiolus crassus circ. 1.5 cm. longus laete flavus saepe indumenti vestigiis conspersus. Flores in racemo-umbellam compactam circ. 10-12-floram aggregati, rhachi puberula et glandulosa circ. 5 mm. longa; bracteae fertiles obovato-spathulatae mucronulatae utrinque lanato-sericeae; bracteolae filiformes vix 3 mm. longae pilosae et pilocristatae; pedicelli circ. 1.5 cm. longi sparsim glandulosi et floccosi saepe rubri. Calyx parvus vix 1 mm. longus inconspicue puberulus minute 5-dentatus vel 5-lobatus. Corolla alba vel rosea maculata evariculata circ. 3.5 cm. longa saepe erecta infundibuliformi-campanulata vel subnutans et oblique campanulata extus glabra, intus puberula 5-loba; lobi emarginati lati circ. 1.5 cm. longi 2 cm. lati. Stamina 10 inaequalia corolla gynaeceoque multo breviora; filamenta villosa. Discus puberulus. Gynaeceum corolla brevius circ. 2.5 cm. longum; ovarium circ. 3.5 mm. longum sulcatum truncatum glabrum; stylus glaber sub stigmate lobulato paullo expansus.

ginous slightly recurved, base truncate or sometimes approaching cordulate with narrow lateral lobes; upper surface dark olive-green with a tinge of red conspicuously shagreened glabrous all except the grooved red midrib in which are withered hairs and glands, primary veins some 15 on each side red and slightly grooved; under surface dark tawny covered by persistent agglutinate indumentum forming a pellicle over the whole surface including the raised midrib and primary veins (which latter it conceals), where pellicle removed the midrib appears bright yellow and this is seen particularly in its thicker part towards base of lamina, indumentum formed of a mixture of the glands and long-branched broad cells of the juvenile leaves now glued together into a more or less uniform or slightly areolate skin; petiole about 1.5 cm. long stout bright yellow rarely a trace of the juvenile hairs and glands. Flowers in small compact raceme-umbels of some 10–12 flowers, the rhachis about 5 mm. long puberulous and glandular; fertile bracts broadly obovate spathulate as much as 2 cm. long 1 cm. broad densely silkily woolly; bracteoles filiform very short about 3 mm. long thickly pilose and hair-crested; pedicels short about 1.5 cm. long sometimes longer sometimes shorter often red sparingly glandular and floccose. Calyx small hardly 1 mm. long reddened with 5 obtuse rounded or pointed lobes puberulous and shortly ciliate. Corolla about 3.5 cm. long erect and nearly regular funnel-shaped campanulate or nodding and irregular campanulate washed rose with many conspicuous crimson dots over posterior side glabrous outside, puberulous at base inside, expanding into a 5-lobed limb; lobes broad about 1.5 cm. long about 2 cm. broad emarginate. Stamens 10 unequal much shorter than corolla and gynaeceum, longest about 2 cm. long, shortest about 1 cm. long; filaments broad villous over a greater part of length from base; anthers about 2 mm. long. Disk copiously puberulous. Gynaeceum about 2.5 cm. long shorter than corolla; ovary about 3.5 mm. long cylindric deeply grooved truncate glabrous; style glabrous stout slightly expanded below the lobulate stigma.

S.W. Szechwan. Mountains around Mu-li. Lat. 28° 12′ N. Alt. 12,000–13,000 ft. In Rhododendron forest. Shrub of 4–6 ft. Flowers white with crimson markings. G. Forrest. No. **16,319**. June 1918.

S.W. Szechwan. Mu-li Mountains. Lat. 28° 12′ N. Alt. 11,000–12,000 ft. Open rocky slopes. Shrub of 4–6 ft. Flowers washed rose deepest in bud with crimson markings. G. Forrest. No. **16,435**. June 1918.

S.W. Szechwan. Mu-li Mountains. Lat. 28° 12′ N. Alt. 12,000 ft. On open rocky slopes. Shrub of 4–6 ft. Flowers

creamy white with few markings. G. Forrest. No. **16,459.** June 1918.

N.W. Yunnan. Western slopes of the Bei-ma-Shan. Lat. 28° 18′ N. Alt. 13,000 ft. In open thickets. Shrub of 3–5 ft. Flowers rose or white flushed rose with crimson markings. G. Forrest. No. **16,489.** July 1918.

A species which recalls *Rh. phaeochrysum*, Balf. f. et W. W. Sm., but is smaller in all its parts and is at once recognised by the bright yellow petioles and midribs of the same colour where the indumentum is removed.

4125

Rhododendron arizelum,* Balf. f. et Forrest.† (Falconeri.)

Robust shrub or small tree as much as 6 m. high. Branches stout, those of the year about 7 mm. in diameter enwrapped in a cinnamon-coloured tomentum, those a year old often over 1 cm. in diameter glabrescent blackening, traces of the tomentum remaining until decortication, bark flaking off leaving a pale reddish smooth surface. Foliage-buds conical large; 5 or 6 outermost scale-leaves imbricate elongated triangular tapering from a broad base to an acuminate tip, or with a wide basal portion and a long tail, insertion broad half-moon shaped, hard woody keeled, cobwebbed outside, glabrous somewhat glossy inside, margin ciliate with cobwebbed hairs which form a tuft at the tip; inner bracts convolute ovate and mucronate slightly keeled sticky forming the chamber to the revolute erect young leaves. Leaves large petiolate as much as 18 cm. long; lamina very thick leathery obovate as much as 15 cm. long 8 cm. broad, apex rounded usually slightly emarginate with a hydathodal

* *ἀρίζηλος*, notable—in allusion to its qualities.

† *Rhododendron arizelum*, Balf. f. et Forrest.—Frutex robustus ad 6 m. altus. Rami crassi annotini tomentosi glabrescentes. Alabastra foliorum conica; perulae extimae acuminatae albido-tomentosae; intimae plus minusve ovatae convolutae viscidae. **Folia petiolata ad 18 cm. longa**; lamina crasse coriacea obovata ad 15 cm. longa 8 cm. lata, apice rotundata emarginata, margine cartilaginea, basi obtusa vel subtruncata; supra atroviridis rugulosa indumenti juvenilis vestigiis conspersa; subtus cinnamomeo-tomentosa indumento bistrato induta, strati superi pilis infundibuliformibus e muro labioque poculi ramos plurimos copiose emittentibus, inferi rosulatis agglutinatis pelliculam crustaceam construentibus; petiolus validus ad 3 cm. longus cylindricus esulcatus glabrescens. Inflorescentia racemoso-umbellata circ. 15-flora, rhachi tomentosa; bracteae extimae rotundatae viscidae, intimae fertiles oblongo-obovatae extus intusque sericeae; bracteolae lineares circ. 1 cm. longae; pedicelli inaequales ad 2.5 cm. longi sub fructu aucti tomentosi. Calyx minutus 8-dentatus. Corolla flavida basi roseo-suffusa oblique campanulata 8-loba. Stamina 16 corolla gynaeceoque breviora; filamenta puberula. Discus glaber. Gynaeceum corolla brevius; ovarium ovoideum 15-16-loculare pilis fasciatis dense tomentosum; stylus glaber staminibus longior sub stigmate late discoideo clavatus. Capsula curvata pilis aurantiacis plus minusve vestita. Semina complanata arillata.

mucro in the sinus or in smaller leaves somewhat obtuse and ending in a long projecting mucro, margin broadly cartilaginous somewhat undulate, base obtuse or subtruncate or even cordulate ; upper surface dark green rugulose and somewhat shagreened more or less splatched with dirty grey vestiges of a thin juvenile coating of cobwebbed hairs, midrib raised at base depressed upwards always clad with grey cobwebbed hairs, primary veins some 12 on each side slightly depressed spreading outwards at a right angle or slightly obtuse angle ; under surface cinnamon-coloured clad all over (the raised midrib and hardly visible veins included) with a dense bistrate persistent indumentum, upper stratum cinnamon-colour persistent of narrow funnel-shaped cup-hairs easily separable each with short multicellular stalk the wall of cells elongated in the axis of the cup and with thicker ridges from which as well as from the margin proceed many thick-walled branches which interlace and give a woolly character to the whole surface, under stratum persistent always concealed by upper stratum white of rosette-hairs with very short stalks, the cells of the hairs thin-walled vesicular agglutinated ; petiole not bearded stout as much as 3 cm. long 6 mm. in diameter gradually passing into the ridged midrib above and below cylindric not grooved upper side with white cobwebbed hairs under surface cinnamon-coloured often glabrescent above. Inflorescence-bud globose. Inflorescence a racemose umbel of 15 or more flowers, rhachis stout more or less cinnamon-tomentose ; outermost sterile bracts a few like those of foliage-buds, followed by many sterile bracts rounded to ovate often with thinner marginal wing all more or less sticky and remaining adherent as flowers open ; inner fertile bracts thin leathery oblong-obovate about 2.5 cm. long 1 cm. broad rounded at top and mucronate, inside finely silky towards top, outside densely and coarsely silky ; bracteoles linear barely 1 cm. long shorter than pedicel, densely adpressedly hairy outside, hair-crested ; pedicels stout straight somewhat unequal as much as 2.5 cm. long elongating in fruit to 3.5 cm., swollen at the oblique top below the flower, tomentose with long branching thin-walled intricately interwoven hairs, no cup-hairs. Calyx only indicated by some tomentose short points sharp or blunt. Corolla fleshy pale yellow with crimson or rose flush at base, campanulate oblique, posterior side arched and somewhat ventricose longer as much as 4.5 cm. long, hardly pouched at base 8-lobed ; lobes rounded imbricate usually emarginate often slightly crenulate about 1 cm. long 1.8 cm. broad, glabrous outside and inside. Stamens 16 slightly unequal shorter than corolla-tube and gynaeceum longest about 2.5 cm. long shortest about 1.5 cm. long ; anthers broad about 3 mm. long ; filaments dilated down-

wards sparingly puberulous for a short distance above the base. Disk glabrous. Gynaeceum a little shorter than corolla on upper side about 4 cm. long; ovary ovoid-truncate 15-locular slightly curved grooved eglandular densely tomentose with pink tinted indumentum of fasciate hairs; style stout glabrous exceeding the stamens ending in a broad lobulate stigma. Capsule slightly curved oblong-ovoid about 3.5 cm. long 1 cm. broad more or less clad with cinnamon-coloured indumentum of orange-coloured fasciate hairs, dehiscing by 12–15 single or a less number of compound (2–4) valves (or these intermixed) leaving 12–15 placentas on the axis. Seeds pale-brown flattened oblong or oval or elliptic or oboval as much as 3 mm. long 1.5 mm. across with a conspicuous lateral arillate wing, a broad fringed membranous arillar chalazal crest and a smaller micropylar one.

W. Yunnan. Shweli-Salween divide. Lat. 25° 20′ N. Alt. 11,000–12,000 ft. Open situations and in Rhododendron forest. Shrub of 15–20 ft. Flowers fleshy, pale yellow flushed rose towards base. G. Forrest. No. **15,857**. July 1917.

W. Yunnan. Shweli-Salween divide. Lat. 25° 30′ N. Alt. 11,000 ft. In open thickets. Shrub of 6–10 ft. Flowers pale yellow with crimson at base. G. Forrest. No. **15,898**. June 1917.

Yunnan. [Without precise locality.] Duplicate in fruit. Oct. 1917. G. Forrest. No. **15,982**.

N.E. Upper Burma. Hpimaw Pass. Alt. 9500–10,500 ft. Low many-branched red-barked tree with thick trusses of dead creamy-white flowers without scent. Just coming out April 20. One of the prevailing rhododendrons as you near the Pass. R. Farrer. No. **863**. April 20, 1919.

N.E. Upper Burma. Ridge along Laktang (Kang Fang route). Alt. 9000–11,000 ft. The commonest rhododendron between 9000 and 11,000 ft. Gnarled much-branched tree up to 20 or 25 ft. high, or bushy shrub of 10–15 ft. at 10,000 ft. or higher. Bark red, hanging in flakes. Flowers pale cream with small purple blotch at base of corolla which is almost regular. The flower is very like No. 3061 [*Rh. sidereum*], but not so yellow. The leaves are quite different, being rusty red underneath with thick indumentum. F. Kingdon Ward. No. **3101**. May 27, 1919.

A fine species of the Falconeri series allied to *Rh. Falconeri*, Hook. f. It is the nearest approach to *Rh. Falconeri* amongst the Chinese species, but is altogether a smaller plant than the Himalayan species. It differs in one conspicuous character—it has no glands on the ovary or style. These glands are most characteristic of *Rh. Falconeri* and its ally *Rh. eximium*, Nutt. In the latter they form the only cover to the ovary in *Rh. Falconeri*, they are always intermixed with stalked branched

hairs which in the type are so numerous and have such curled interlocking branches that the presence of glands is concealed and this probably accounts for the omission of reference to glands in the descriptions of *Rh. Falconeri*. In some forms of what is called *Rh. Falconeri* these hairs are comparatively few but I have not seen a specimen from which the hairs were entirely absent nor have I seen one from which the glands were absent. There is, however, more than one plant included in the *Rh. Falconeri* of Herbaria and probably also of gardens and investigation of the species is much needed. There is no trace in *Rh. arizelum* of the bearding on the petiole which marks *Rh. eximium*.

The cup hairs of the indumentum are here much shorter than those of *Rh. Falconeri* and *Rh. eximium*, but have the stiff branched habit which is so conspicuous in these, and they can be separated from one another without difficulty.

4126 **Rhododendron australe,** Balf. f. et Forrest.* (Ovatum.)

A slender-branched twiggy shrub as much as 2.5 m. high. Branches a year old about 1.5 mm. in diameter pale green densely pubescent with the curved simple (fish-hook) hairs of the Ovatum series also glandular with long stoutly stalked ovoid glands sprinkled amongst the hairs, the indumentum persisting more or less until decortication after three years or so. Annual growths usually about 5 cm. long with the foliage-leaves more or less clustered at the top and as they persist for about 3 years they form false whorls on the stems demarcating the successive annual growths. Mature foliage-buds unknown. Leaves petiolate as much as 9.5 cm. long sometimes the lower ones on the twig distant from the apical clustered ones; lamina papery about 7.5 cm. long and 3 cm. broad oblong or oblong-lanceolate or oblong-oval, apex acuminate and tapered

* *Rhododendron australe*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus. Rami tenues annotini circ. 1.5 mm. diam, pubescentes glandulosi. Folia petiolata ad 9.5 cm. longa saltem triennia; lamina tenuis papyracea oblonga vel oblongo-lanceolata vel oblongo-ovalis ad 7.5 cm. longa 3 cm. lata sursum in mucronem elongatum attenuata, margine minute cartilaginea leviter aspersa, basi late obtusa; supra nitens olivacea, subtus pallidior; utrinque costa media pilis hamatis puberula caeteroquin glabra; petiolus puberulus et glandulosus circ. 2 cm. longus. Flores in quaque inflorescentia 4 in axillis foliorum superiorum singulatim dispositi, quisque bracteatus bracteis sub anthesi persistentibus amplexicaulibus; pedicelli circ. 1.5 cm. longi puberuli et glandulosi. Calyx subfoliaceus circ. 7 mm. longus 5-fissus; cupula extus puberula et glandulosa; lobi ovati vel subelliptici apice rotundati extus glabri glanduloso-fimbriati eciliati. Corolla rosea sparsim maculata aperte cupularis circ. 3.3 cm. longa extus glabra intus puberula 5-loba; lobi elliptici vel ovales subaequales circ. 2 cm. longi 1.8 cm. lati emarginati crenulati. Stamina 5 inaequalia longissima corollam subaequantia; filamenta pilis longis haud vesiculosis puberula. Discus puberulus. Gynaeceum circ. 3.5 cm. longum corollam superans; ovarium circ. 3 mm. longum petasiforme glandulosum; stylus glaber.

into a prominent hydathodal mucro 1 mm. long tuberculate at top, margin very finely cartilaginous flat obscurely undulate and marked by the red scars of fallen glands, base broadly obtuse, last leaves of the shoot around the terminal bud much smaller often elliptic with lamina 1.5 cm. long 1 cm. broad; upper surface bright olive-green glossy, midrib elevated in a groove and puberulous with curved hairs, surface otherwise glabrous, primary veins 10–12 on each side and with the secondary veins forming a prominent network (in dry leaf) the ultimate veinlets very small and forming a reddish network with very small meshes; under surface much paler opaque smooth, midrib slightly pink-tinted elevated and more or less puberulous surface otherwise glabrous, primary veins pink-tinted conspicuous as are some of the secondary veins; on both sides faintly punctulate with bases of fallen glands; petiole pale green about 2 cm. long densely puberulous and glandular like stem. Inflorescence composed of 1-flowered axillary umbels fasciculate at the end of the twigs usually 4 in each fascicle, no terminal umbel; each member of the fascicle encircled at base by persistent crustaceous buff-coloured bracts; inflorescence-bud ovoid; outer bracts very small rounded or half-moon-shaped, inner bracts ovate or rounded-ovate cucullate puberulous outside and gland-fringed, the innermost bracts grasping the pedicel; pedicel about 1.5 cm. long pubescent and glandular with curled hairs and ovoid red long-stalked glands. Calyx somewhat foliaceous 7 mm. long cut to near base into 5 lobes; cup puberulous and glandular outside, puberulous inside only at the base; lobes large membranous ovate or somewhat elliptic rounded or obtuse 5 mm. broad venation flabelliform glabrous on the back and inside, densely fringed with red or orange-coloured glands not hair-ciliate. Corolla about 3.3 cm. long openly campanulate or bowl-shaped deep rose with a few inconspicuous crimson spots on posterior petal, somewhat thin glabrous outside, puberulous at base inside, 5-lobed; lobes somewhat unequal (antero-lateral larger) somewhat elliptic or oval about 2 cm. long and 1.8 cm. broad emarginate crenulate. Stamens 5 unequal, longest about 3.2 cm. long with anther 4 mm. long, about equalling the corolla, shortest about 2.2 cm. long with anther 3 mm. long; filaments orange-coloured slightly broadened downwards, from the base to near the middle villous with long thin pointed hairs eglandular. Disk puberulous below ovary. Gynaeceum about 3.5 cm. long exceeding corolla and stamens; ovary about 3 mm. long somewhat dome-shaped dark-coloured slightly grooved and truncate glandular on the ridges and at apex, less so in the grooves; style orange-red glabrous slightly expanded under the lobulate stigma.

W. Yunnan. Type from Tengyueh. G. Forrest. [Without number.]

W. Yunnan. Shweli-Salween divide. Lat. 25° 30′ N. Alt. 10,000 ft. In open thickets. Shrub of 6–8 ft. Flowers deep rose. G. Forrest. No. **15,673.** June 1917.

A species of the Ovatum series representing in the southern area of Western Yunnan *Rh. leptothrium,* Balf. f. et Forrest, of the northern area (Li-ti-ping and the Mekong-Yangtze divide), from which it is easily separated by its brighter green foliage, the leaves as a rule tapered into the long mucro not emarginate or truncate below it with a much closer ultimate reticulation of the veins, larger flowers, lobes of the calyx gland-fringed not hair-ciliate.

4127 **Rhododendron chaetomallum,*** Balf. f. et Forrest.† (Haematodes.)

Shrub as much as 1.5 m. high with thin straight divergent twiggy branches, those a year old about 2 mm. in diameter bearing rosettes of 4–6 leaves at the end, the last leaves of a year usually very small and ensheathing the terminal bud, leaves persisting often for two years. Branches of the year reddened densely clad with a bistrate indumentum, the upper stratum of long wavy intermingling bristle-hairs reddened below sometimes unbranched but usually ending in a tuft of short pointed branches the under stratum of white flocks of shortly branching intricately interwoven hairs, indumentum more or less detersile in the reddened twigs a year old but vestiges remain on the grey older parts of the branches until decortication, nodular swellings at end of each season's growth which average about 5 cm. in length. Terminal foliage-buds ovoid pointed enclosed by the last foliage-leaves of the year which have long convolute vaginal petioles and much reduced lamina the whole

* *χαίτη,* loose flowing hair ; *μαλλός,* fleece—in allusion to the indumentum.

† *Rhododendron chaetomallum,* Balf. f. et Forrest.—Frutex ad 1.5 m. altus. Rami tenues stricti indumento bistrato setarum rubrarum et pilorum floccosorum obtecti. Alabastrorum perulae extimae longe caudatae mox deciduae. Folia petiolata ad 9.5 cm. longa ; lamina coriacea obovata vel oblongo-obovata ad 9 cm. longa 4 cm. lata, apice rotundata apiculato-mucronata, margine cartilaginea subplana, basi obtusa ; supra olivacea floccorum vestigiis conspersa ; subtus fulvo-cinnamomea indumento bistrato tomentoso demum subagglutinato vestita ; petiolus circ. 5 mm. longus setulosus et floccosus. Umbella 4–6-flora ; pedicelli circ. 1.5 cm. longi setulosi eglandulosi. Calyx ruber ad 3 mm. longus cupularis ; cupula glabra ; lobi 5 rotundati floccoso-ciliati decidui. Corolla tubuloso-campanulata circ. 4 cm. longa atro-coccinea glabra 5-lobata ; lobi lati emarginati. Stamina 10 inaequalia corolla breviora, longissima gynaeceo longiora ; filamenta glabra. Discus glaber. Gynaeceum corolla multo brevius circ. 2.3 cm. longum ; ovarium petasiforme circ. 3 mm. longum dense flavo-tomentosum ; stylus glaber. Capsula recta circ. 1.5 cm. longa 7 mm. diam. **dense tomentosa valvis 5–10 dehiscens.**

showing transition to scale-leaves, scale-leaves falling as bud expands; outer scale-leaves as much as 1.5 cm. long, longer than the body of the bud, woody with short broad base tapering upwards into a long keeled tail ending in a red apicular tip its margins recurving grey outside with an indumentum of intricately woven branching hairs; intermediate scale-leaves oval oblong apiculate clad like the outer; innermost scale-leaves membranous yellowish or yellow-green carried up on the elongating shoot as much as 4 cm. long spathulate and tapering into a long apiculus, pubescent on back with interlocking floccose hairs and flock-fringed, hairs densely clustered round the tapering point; young leaves revolute in bud with a white sparse indumentum of rosette long-branched hairs on upper surface, below densely tomentose white. Leaves petiolate as much as 9.5 cm. long; lamina leathery obovate or oblong-obovate as much as 9 cm. long 4 cm. broad apex rounded or even subtruncate with a short apiculus and red tuberculate mucro, margin cartilaginous entire, base obtuse and more or less decurrent on petiole; upper surface dark olive-green mat shagreened sprinkled with vestiges of juvenile rosette flocks, midrib grooved lined by flock-hairs, primary veins 10–12 on each side slightly grooved; under surface dark tawny clad everywhere with a bistrate persistent indumentum, the hairs of upper stratum with long zigzag many-celled stems much branched the branches interweaving and ultimately becoming slightly agglutinate so that the leaf-surface does not appear woolly and honeycombed but somewhat smooth, often in older leaves cracking slightly, under stratum of rosette-hairs with hardly any stalk the few branches of each rosette long twisted pointed, midrib raised slightly reddened covered by the indumentum, primary veins hardly showing; petiole about 5 mm. long grooved above clad with an indumentum like the stem. Flowers in 4–6-flowered terminal umbels; outer bracts like the outer scale-leaves of foliage-bud and of like size followed by oblong broad crustaceous bracts with cucullate upper half thinner on the margin, innermost fertile bracts yellow silky obovate nearly 2 cm. long; bracteoles thin linear and spathulate about 1 cm. long shorter than pedicel densely pilose from base; pedicel about 1.5 cm. long densely clad with long bristle-hairs branched at the tip eglandular hardly expanded below the calyx. Calyx red somewhat fleshy about 3 mm. long cup-shaped glabrous on back cut to about half its length into 5 rounded or pointed flock-fringed lobes ultimately splitting down interpretative lines and falling off from base of cup. Corolla deep crimson tubular-campanulate about 4 cm. long glabrous inside and outside 5-lobed; tube slightly fleshy at base and there slightly gibbous and retuse; lobes rounded broad about 1.5 cm.

long 2.2 cm. broad emarginate. Stamens 10 much shorter than corolla, unequal longest about 2.6 cm. long, shortest about 1.6 cm. long ; filaments white glabrous dilated downwards ; anthers dark crimson. Disk glabrous. Gynaeceum shorter than longest stamens about 2.3 cm. long ; ovary dome-shaped broad truncate deeply grooved about 3 mm. long densely clad with a yellow tomentum composed of long fasciate firm hairs ; style stout glabrous expanded below the discoid lobulate pale stigma where it forms a lip. Capsule straight about 1.5 cm. long 7 mm. in diameter densely brown-woolly dehiscing from apex to base by 5–10 woody valves, style often persisting.

S.E. Tibet. On Doker-la, Mekong-Salween divide. Lat. 28°25′ N. Alt. 12,000–13,000 ft. Open bouldery slopes. Shrub of 3–4 ft. Flowers deep crimson. G. Forrest. No. **16,691.** July 1918.

S.E. Tibet. Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 35′ N. Alt. 12,000 ft. Open situations amongst rocks. Shrub of 4–5 ft. In fruit. G. Forrest. No. **14,987.** Oct. 1917.

Western N.W. Yunnan. At Na-ki-lu, Mekong-Salween divide. Lat. 27° 50′ N. Alt. 11,000–12,000 ft. In open thickets and on boulder-strewn slopes. Shrub of 4 ft. Flowers ? probably deep crimson. G. Forrest. No. **17,329.** Oct. 1918.

Western N.W. Yunnan. On the Si-la Pass, Mekong-Salween divide. Lat. 28° 12′ N. Alt. 13,000 ft. Shrub of 2–4 ft. Duplicate in fruit. G. Forrest. No. **17,330.** Oct. 1918.

In *Rh. chaetomallum* we have a member of the Haematodes series from far N.W. Yunnan and S.E. Tibet, representing there *Rh. haematodes*, Franch. which is a plant of the Tali Range and *Rh. aemulorum*, Balf. f. which is a southern representative of the series on the Shweli-Salween divide and in N.E. Upper Burma. From both of these the setulose indumentum on the stem and leaf-petioles give a distinction. In general habit of growth *Rh. chaetomallum* recalls the type—developed so markedly in the Tsarong—which is seen in *Rh. eudoxum*, Balf. f. et Forrest and its allies and in *Rh. sanguineum*, Franch. and its allies. But here the indumentum has evolved as a thick somewhat loose tomentum over the under surface of leaf in contrast with the thin detersile form it assumes in the *Rh. eudoxum* phylum and the agglutinate pellicle-like condition in which it appears in the *Rh. sanguineum* phylum. The linking of all these forms will be an interesting task for those who deal with Rhododendrons some years hence, when the species in the centre of distribution of the genus have been discovered and identified.

Rh. chaetomallum is one of the species of Rhododendron in which mycophyllon appears.* Some of the leaves have quite a blackened under surface through the development of fungus.

* See Notes R.B.G. Edin., xii (1919), 145.

Rhododendron chloranthum,* Balf. f. et Forrest.† (Trichocladum.)

Deciduous-leaved shrub about 1 m. high with slender somewhat twiggy branches and leaves deciduous after one season, the flowers appearing annually slightly before the leaves. Branches of the year green barely 1 mm. in diameter densely clad with long undulate setae covering a few distant whitish or yellowish peltate scales, the one-year-old whitish-grey branches more sparingly setose and often glabrescent, older branches dark grey and with vestiges of the setae and scales. Foliage-buds fusiform scale-leaves all deciduous as bud opens; outermost scale-leaves crustaceous bright brown rounded glabrous outside and finely and shortly ciliate above, followed by oblong-oval ones of like character, innermost scale-leaves somewhat membranous paler or somewhat greenish-yellow narrowly oblong-oval about 1.2 cm. long 3 mm. broad densely lepidote along the middle outside sparingly ciliate on margin below densely so over the rounded tip and around the red mucro; young leaves conduplicate-convolute glabrous above, lepidote and setulose below, setulose-ciliate; foliage-buds in axil of one or two last leaves of flower-shoot, which are set close below the flower-bud, not developing and thus is left a short gap between the inflorescence and elongating lateral foliage-shoots below it. Leaves (not quite mature) petiolate as much as 4.3 cm. long; lamina thin papery oval or oboval as much as 3.8 cm. long 2 cm. broad, apex rounded often somewhat retuse at point of origin of short mucro, margin plane red setulose-ciliate, base broadly obtuse or rounded; upper

* **χλωρός, green-yellow—in allusion to the flower-colour.**

† *Rhododendron chloranthum*, Balf. f. et Forrest.—Frutex circ. 1 m. altus foliis annuis floribusque praecocibus. Rami subvirgati hornotini circ. 1 mm. diam. lepidoti pilis setiformibus dense obtecti, annotini subglabrescentes. Alabastra fusiformia; perulae extimae crustaceae rotundatae extus glabrae, intermediae oblongo-ovales, intimae submembranaceae anguste oblongo-ovales circ. 1.2 cm. longae extus dense lepidotae. Folia (vix matura) petiolata ad 4.3 cm. longa; lamina papyracea ovalis vel obovalis ad 3.8 cm. longa 2 cm. lata, apice rotundata mucronata alata nunc retusa, margine plana tenuis rubra setuloso-ciliata; supra atroviridis glaberrima costa media et venis primariis rubris subelevatis; subtus pallidior plus minusve setulosa discontigue lepidota squamulis inter se 1 mm. distantibus; petiolus ruber circ. 5 mm. longus. Flores in racemo-umbellam brevem 4–5-floram dispositi, rhachi pubescente lepidota; bracteae mox deciduae interiores extus puberulae et lepidotae; bracteolae lineares apicem versus lepidotae et setulosae; pedicelli ad 2.5 cm. longi sparsim lepidoti et setulosi. Calyx 5-lobi; lobi rotundati vel semilunati inaequales ad 2 mm. longi sparsim lepidoti esetulosi. Corolla flavido-viridis maculata a basi campanulata vix 2 cm. longa extus lepidota epilosa intus puberula; lobi 5 rotundati circ. 6 mm. longi 1 cm. lati integri. Stamina 10 inaequalia corollam subaequantia; filamenta villosa. Discus glaber. Gynaeceum staminibus longioribus brevius; ovarium circ. 4 mm. longum petasiforme truncatum sparse lepidotum; stylus validus declinatus ovario longior glaber ad apicem clavatus; stigma lobulatum.

surface dark blackish-green mat glabrous, midrib and primary veins (about 10 on each side) raised red ; under surface paler grey-green lepidote with small distant peltate raised unequal scales with thick umbo and hardly any fringe 1 or 2 scales in a sq. mm. also setulose more or less usually more densely so along raised red midrib and primary veins very densely towards base ; petiole red about 5 mm. long densely setulose. Inflorescence a 4–5-flowered terminal shortly racemose umbel, rhachis whitely pubescent and lepidote ; inflorescence-bud globose ; bracts and bracteoles deciduous as bud opens, outer bracts brown coriaceous ovate pointed glabrous, inner bracts coriaceous rounded convolute densely lepidote and puberulous outside 1.3 cm. long ; bracteoles linear about 1.3 cm. long shortly pilose below setulose towards base and lepidote towards apex ; pedicels varying in length as flowers open successively at most 2.5 cm. long stiff stoutish dark green becoming dark purple very sparingly lepidote and setulose sometimes glabrescent swollen below the calyx and there very dark-coloured. Calyx small at most 2 mm. long usually less with 5 unequal membranous lobes rounded or semilunate sparingly lepidote outside or with a scale-fringe or glabrous, occasionally some minute marginal cilia. Corolla light yellow tinged green at base, spotted green posteriorly, campanulate from base barely 2 cm. long lepidote and epilose, outside puberulous, inside at base expanding into a spreading 5-lobed limb ; lobes rounded entire about 6 mm. long 1 cm. broad. Stamens 10 unequal, longest about equalling corolla, shortest about 7 mm. long ; filaments stout greenish-yellow, glabrous at base often over 3 mm. in posterior stamens which are densely villous within corolla-tube the hairs stout long vesicular white, over about 1 mm. in others which have shorter and fewer hairs ; anthers ochre-coloured about 2 mm. long. Disk glabrous. Gynaeceum shorter than corolla and longest stamens about 1 cm. long ; ovary about 4 mm. long dome-shaped truncate shallowly grooved sparingly lepidote ; style stout glabrous deflexed broadly expanded at top below the lobulate stigma. Capsule short straight about 5 mm. long dehiscing from apex by 5 valves.

N.W. Yunnan. Li-ti-ping. Lat. 27° 12′ N. Alt. 11,000 ft. Open situations amongst scrub. Shrub of 2–4 ft. Flowers more or less precocious, light yellow tinged green at base. G. Forrest. No. **13,900.** June 1917.

One of the Trichocladum series. Its nearest ally is *Rh. melinanthum,* Balf. f. et Ward, from which it may at once be distinguished by the underleaf indumentum. In *Rh. chloranthum* the scales are distant seldom more than 1 mm., whilst in *Rh. melinanthum* they are much closer, some 4 to 5 in each

square mm. Then in the former the style is shorter not longer than the longest stamens. From *Rh. trichocladum*, Franch. itself the calyx without bristles separates it. From *Rh. xanthinum*, Balf. f. et W. W. Sm. the absence of hairs on outside of corolla is a diagnostic mark.

1889

Rhododendron coryphaeum,* Balf. f. et Forrest.† (Grande.)

Robust shrub with thick branches, those a year old about 1 cm. in diameter coated with a whitish crustaceous indumentum of cobwebbed more or less agglutinate hairs traces of which remain on the older stems. Foliage-bud unknown. Leaves epetiolate as much as 25 cm. long thickly leathery broadly oblanceolate or narrowly oblong-obovate broadest at the apex and there as much as 9 cm. broad then tapered gradually to the base, apex rounded or subtruncate sometimes slightly retuse, mucronate the mucro rounded tuberculate very short sometimes turned downwards, margin broadly cartilaginous slightly recurved, at the base the lamina is prolonged downwards to point of insertion of leaf where it may be nearly 2 cm. broad the basal portion simulating a winged petiole; upper surface mat green somewhat rugulose shagreened glabrous, the midrib grooved and lined with vestiges of a juvenile hair-indumentum at the base passing into a broad ungrooved wrinkled ridge recalling the surface of a petiole, primary veins some 14–16 on each side emerging from midrib at an acute angle and sharply ascending slightly grooved; under surface white or grey-white covered by a thin indumentum of long branching intricately interwoven hairs

* *κορυφαῖος*, leading—in allusion to its size.

† *Rhododendron coryphaeum*, Balf. f. et Forrest.—Frutex robustus ramis crassis indumento sordide albido crustaceo plus minusve indutis. Folia ad 25 cm. longa subepetiolata late oblanceolata vel anguste oblongo-obovata ad 9 cm. lata ab apice rotundato vel subtruncato paullo retuso mucronatoque deorsum gradatim attenuata (margine cartilagineo) ad insertionem saepe 1.5 cm. lata; supra opaca subrugulosa glabra, costa media sulcata sulco vestigiis pilorum juvenilium impleto basi in pulvinum elevatum prolongata, venis primariis impressis utrinque 14–16 a costa media acute divergentibus; subtus albida indumento tenui crustaceo subnitido laevi vestita, costa media venisque primariis elevatis glabrescentibus. Flores circ. 15 in racemoso-umbellam dispositi, rhachi brevi vix 2 cm. longa; bracteae exteriores steriles rotundatae vel ovatae viscidae, intimae fertiles oblongo-spathulatae extus intusque sericeae; bracteolae breves circ. 5 mm. longae pilosae; pedicelli circ. 2 cm. longi indumento adpresso vestiti. Calyx minute dentatus. Corolla obliqua campanulata varo basali rubro maculisque paucis notata circ. 4.5 cm. longa glabra 8-lobata; lobi imbricati rotundati emarginati. Stamina 16 inaequalia corolla gynaeceoque breviora; filamenta glabra. Discus glaber. Gynaeceum corolla paullo brevius; ovarium oblongo-ovoideum 10-loculare, pilis fasciatis dense tomentosum; stylus glaber. Capsula curvata, ad 4 cm. longa pilis fasciatis aurantiacis plus minusve vestita. Semina brunnea complanata anguste arillata et crista membranacea chalazali notata.

and rosulate hairs with broad branches, the whole forming an agglutinate crustaceous persistent smooth somewhat glossy layer, midrib very prominent brownish or blackish-purple glabrescent, primary veins very prominent ribs more or less glabrescent. Inflorescence a compact racemose umbel of some 15 flowers with a short rhachis barely 2 cm. long clad with thin pellicle of indumentum; inflorescence-bud globose; outer sterile bracts rotundate to ovate thick coriaceous with thinner margins mucronate viscid, inner fertile bracts oblong spathulate or obovate-spathulate or spathulate about 3 cm. long 1.5 cm. broad sericeous inside and outside; bracteoles short linear about 5 mm. long or a little more pilose and hair-crested; pedicels short about 2 cm. long enwrapped in a thin indumentum of long branched somewhat agglutinate hairs slightly expanded under the calyx and oblique to the flower. Calyx minute clad like the pedicel very shortly toothed. Corolla campanulate oblique with a small red basal blotch and a few spots posteriorly, about 4.5 cm. long on posterior side, glabrous inside and outside hardly gibbous at the base 8-lobed; lobes imbricate about 1 cm. long 1.5 cm. broad emarginate. Stamens 16 unequal shorter than corolla and gynaeceum, longest about 3.5 cm. long shortest about 2.5 cm.; filaments glabrous; anthers oblong about 3 mm. long. Disk glabrous. Gynaeceum a little shorter than corolla; ovary oblong-ovoid truncate 10-locular grooved densely clad with a pink tomentum of fasciate hairs with stout long stalks and erect branches; style glabrous stout slightly club-shaped below the discoid broad lobulate stigma. Capsule curved as much as 4 cm. long over 1 cm. in diameter more or less tomentose with orange-coloured fasciate hairs with stout stalks and short erect branches. Seeds flat brown about 2.5 mm. long 1 mm. across with a narrow lateral aril-wing, a large chalazal membranous crest, and trace of a funicular fringe.

Western N.W. Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 11,000–12,000 ft. Duplicate of 1917. G. Forrest. No. **16,561.** June 1918.

Yunnan. [Without precise locality.] Duplicate of F. No. In fruit. G. Forrest. No. **17,420.** Oct. 1918.

Plant of the Grande series, a near ally of *Rh. praestans*, Balf. f. et W. W. Sm. It is a smaller-leaved species with the primary veins coming off and ascending at about half a right angle from the midrib, and the indumentum is almost persistently grey in tint. The flowers of its compact trusses have much shorter pedicels and the ovary is consistently 10-chambered in contrast to the 8-chambered ovary of *Rh. praestans*. As in *Rh. praestans* the leaves can hardly be described as petiolate. The lamina extends right to the point of insertion of the leaf.

4389 **Rhododendron cymbomorphum,*** Balf. f. et Forrest.† (Souliei.)

Virgate shrub as much as 2.5 m. high. Branches slender straight when a year old about 2 mm. in diameter. Young branches dark purple glandular the glands short-stalked ovoid red, persisting (their bases only) as small reddish warts on the older pale buff-coloured twigs. Foliage-buds elongated narrow fusiform pointed; outer scale-leaves crustaceous rounded often split at apex sometimes with a short point, epilose outside or with a few greasy hairs, margin sparsely ciliate with greasy hairs more at the top, followed by more oblong blunt scale-leaves; innermost scale-leaves carried up on elongating axis nearly oblong or oblanceolate or lanceolate as much as 4 cm. long 6 mm. broad at middle, acute or acuminate narrowed downwards into a distinct petiole, red-glandular at base outside over petiole and along midrib, finely sparingly ciliate; young leaves revolute in bud glabrous above, below densely clad with short erect unbranched greasy orange or white hairs, petiole glandular. Leaves petiolate as much as 11.5 cm. long 4–5 produced each year towards end of twig sometimes one or two lower down not persisting over second year; lamina thin of parchment consistence oblong-oval or oblong as much as 9 cm. long 4 cm. broad, broadly obtuse at apex ending in a shortly beaked tuberculate red mucro, margin flat narrowly cartilaginous and slightly pink-tinted, base truncate or rounded or subcordulate; upper surface olive-green mat finely shagreened glabrous, midrib grooved glabrous, primary veins some 12–15 on each side; under surface paler grey-green clad all over with vestiges of short greasy juvenile hairs often orange-coloured, midrib raised pink glabrous, primary veins and ultimate venation submerged

* κύμβος, cup—in allusion to form of corolla.

† *Rhododendron cymbomorphum*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus. Rami tenues stricti (annotini circ. 2 mm. diam.), juveniles purpurei glandulosi, vetustiores pallide fulvi glanduloso-punctulati. Alabastra fusiformia; perulae extimae crustaceae extus epilosae margine sparsim sebaceo-ciliatae; intimae oblongo-lanceolatae vel oblanceolatae petiolatae acutae basi rubro-glandulosae. Folia ad 11.5 cm. longa petiolata; lamina chartacea oblongo-ovalis vel oblonga ad 9 cm. longa 4 cm. lata, apice rotundata vel late obtusa mucronata, margine plana, basi truncata vel rotundata vel subcordulata; supra olivacea opaca glabra; subtus griseo-viridis venis ultimis intricatim ramosissimis rubris notata pilis brevibus caulifloris sebaceis obtecta; petiolus ad 2.5 cm. longus purpureis glandulosis. Flores in umbellas vel racemo-umbellas 4-7-floras dispositi rhachi glandulosa; bracteolae pedicellis multo breviores; pedicelli ad 3.5 cm. longi purpurei patentes glandulosi sub calyce expansi. Calyx 5-lobus extus glandulosus; lobi oblongi apice rotundati. Corolla alba vel flava emaculata aperte cupulari-campanulata circ. 4 cm. longa utrinque glabra 5-loba; lobi lati circ. 2 cm. longi 2.5 cm. lati emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta obscure puberula. Discus glaber. Gynaeceum corolla paullo brevius; ovarium circ. 3.5 mm. longum conoideum sulcatum truncatum dense rubro-glandulosum; stylus ad medium glandulis rubris aurantiaco-stipitatis vestitus.

showing as a very fine much-branched reddish reticulum; petiole as much as 2.5 cm. long red grooved above, glabrous but with vestiges of the juvenile red glands. Flowers in a terminal 4–7-flowered umbel or shortly racemose umbel, the rhachis red-glandular; bracts unknown; bracteoles shorter than pedicels about 8 mm. long linear slightly clavate at top pilose throughout not markedly hair-crested; pedicels 2.5–3.5 cm. long expanded beneath the calyx spreading purple sparingly glandular with ovoid stalked red glands. Calyx conspicuous about 4 mm. long with a cup about 1 mm. sparingly glandular outside, 5-lobed; lobes yellowish oblong rounded at top about 3 mm. long sprinkled with glands. Corolla yellow without spots or blotch openly cup-shaped or widely campanulate from the base 4 cm. or a little more long, longer than stamens and gynaeceum, glabrous outside and inside, 5-lobed; lobes broad nearly orbicular about 2 cm. long 2.5 cm. broad emarginate. Stamens 10 unequal all shorter than corolla and gynaeceum, longest about 2.5 cm. long, shortest about 1-5 cm.; filaments slightly expanded downwards obscurely puberulous above the base the hairs often mere vesicular papillae. Disk glabrous. Gynaeceum shorter than corolla longer than stamens about 3.5 cm. long or a little more; ovary conoid grooved truncate 3.5 mm. long densely red-glandular, the stalks of the glands yellow; style glandular with long yellow-stalked glands to about its middle, slightly expanded below the lobulate dark-coloured stigma.

N.W. Yunnan. On the Bei-ma-Shan. Lat. 28° 12′ N. Alt. 11,000–12,000 ft. Shady pine forests and amongst scrub. Shrub of 4–8 ft. Flowers yellow without markings. G. Forrest. No. **13,939.** June 1917.

One of the Souliei series, with markedly oblong leaves and glandular petioles and stems and bearing yellow flowers with yellowish calyx-lobes, puberulous stamens, and style glandular to the middle. In this corolla it approaches *Rh. Wardii*, W. W. Sm. and *Rh. croceum*, Balf. f. et W. W. Sm., but the colour is not so intense and the flowers are smaller. *Rh. panteumorphum*, Balf. f. et W. W. Sm. of the Selense series, is not unlike our plant, and has also yellow flowers, but it has a glabrous style. Forrest has collected quite a number of forms of the Souliei and Selense series showing that the type which includes many good garden plants is widespread in N.W. Yunnan.

4890 **Rhododendron dendritrichum,** Balf. f. et Forrest.*

Shrub as much as 4.5 m. high with stout branches. Branches a year old about 4 mm. in diameter ash-grey through a close

* *Rhododendron dendritrichum*, Balf. f. et Forrest.—Frutex ad 4.5 m. altus ramis crassis. Ramuli annotini circ. 4 mm. diam. indumento griseo subagglutí-

coating of indumentum composed of closely interwoven branched stalked hairs which are more or less agglutinate and persist more or less until decortication. Foliage-buds unknown. Leaves triennial petiolate deflexed at flowering as much as 18.5 cm. long ; lamina leathery oblanceolate as much as 16.5 cm. long 4.5 cm. broad, apex somewhat beaked with a short apiculus often curved and ending in a small red hydathodal mucro, margin cartilaginous obscurely undulate and distantly faintly notched, tapered to the cuneate base ; upper surface opaque olive-green minutely shagreened glabrous, midrib and rest of venation dark red, midrib deeply and narrowly grooved, primary veins 20 or more on each side slightly grooved ; under surface at first a true buff-colour afterwards paling covered all over including the raised midrib by a woolly persistent indumentum with a slightly honeycombed surface and composed of an understratum of hardly stalked rosette-hairs with many short thin vesicular branches and an upper luxuriant stratum of remarkable tree-like hairs with a thick many-celled trunk and abundant recurving long cylindric pointed branches from its base upwards which curl and take on a tendrillar form at their ends and so interlock ; petiole stout about 2 cm. long clad like the young stem. Flowers in a terminal very shortly racemose umbel of 15 or more flowers, rhachis barely 1 cm. long glabrous or with a sprinkling of short floccose hairs ; bracts falling early unknown ; bracteoles filiform much shorter than pedicels about 1 cm. long pilose throughout and with a white hair-crest ; pedicels strict slender erect crowded 2–2.5 cm. long sparingly floccose expanded and slightly oblique under the flower. Calyx very small not 1 mm. long dark crimson fleshy glabrous with an undulate somewhat paler erose margin showing 5 minute teeth. Corolla oblique on the pedicel in the lateral flowers of the truss, funnel-shaped-campanulate from the base about 3.5 cm. long white faintly flushed rose with deep crimson basal posterior blotch

nato plus minusve persistente vestiti. Folia triennia petiolata ad 18.5 cm. longa ; lamina coriacea oblanceolata ad 16.5 cm. longa 4.5 cm. lata, apice subrostrata, margine cartilaginea plana, deorsum in basim cuneatam attenuata ; supra olivacea opaca glabra rubro-venulosa ; subtus indumento bistrato pallide fulvo superficieque subalveolari ubique (costa media elevata inclusa) vestita, indumenti pilis supernis dendriformibus fibrillosis ; petiolus crassus ut ramuli vestitus. Flores in racemo-umbellam circ. 15-floram aggregati rhachi vix 1 cm. longa obscure floccosa ; bracteolae breves circ. 1 cm. longae filiformes pilosae et pilo-cristatae ; pedicelli tenues stricti sparsim floccosi sub calyce expansi. Calyx parvus vix 1 mm. longus carnosulus glaber ruber margine eroso-undulatus obscure 5-dentatus. Corolla alba maculata et varo coccineo basali notata infundibulari-campanulata circ. 3.5 cm. longa glabra 5-loba ; lobi rotundati emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora ; filamenta lata minutissime puberula. Discus glaber. Gynaeceum circ. 3 cm. longum ; ovarium elongatum tenue cylindricum truncatum circ. 6.5 mm. longum glabrum ; stylus validus glaber stamina superans.

and a few oblong spots above it glabrous outside and inside, slightly pouched at base expanding into an open 5-lobed limb ; lobes rounded emarginate about 7 mm. long and 1.4 cm. broad. Stamens 10 unequal all shorter than corolla and gynaeceum, longest about 2.8 cm. long with anther 2.5 mm. long, shortest about 1.8 cm. long with anther 2 mm. long ; filaments broad minutely puberulous at base the hairs no more than vesicular spheres. Disk glabrous. Gynaeceum about 3 cm. long a little shorter than corolla and longer than stamens ; ovary long thin cylindric about 6.5 mm. long slightly grooved truncate glabrous ; style glabrous stout expanding below the discoid lobulate stigma to which it supplies an encircling lip.

West N.W. Yunnan. Mekong-Salween divide. Lat. 28° 12′ N. Alt. 12,000–13,000 ft. In pine and rhododendron forest. Shrub of 10–15 ft. Flowers white faintly flushed rose, with crimson markings and a blotch of same shade at base. G. Forrest. No. **16,366.** March 1918.

A species of the group of large-leaved Rhododendrons with woolly persistent indumentum in which the calyx is very small, the corolla more or less funnel-shaped with a basal blotch and spots and the ovary and style glabrous. It is distinguished by the branched tree-like form of the hairs of the indumentum with the branches curled and tendril-like forming a slightly honeycombed undersurface to the leaf.

u891 **Rhododendron eclecteum,*** Balf. f. et Forrest.† (Thomsoni.)

Shrub as much as 2.5 m. high with stout straight branches. Branches of the year stiff purple with a glaucous bloom and glandular, the glands red ovoid on conspicuous stalks, 2.3 mm. in diameter, year old branches as much as 6 mm. in diameter yellowish becoming ash-grey punctulate with the bases of fallen glands. Foliage-buds are nest buds red ovoid short pointed ;

* *ἐκλεκτέος*, to be chosen out—as a plant worthy of cultivation.

† *Rhododendron eclecteum*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus. Rami hornotini stricti glauco-purpurei glandulosi, annotini ad 6 mm. diam. punctulati. Alabastra purpurea glabra. Folia petiolata ad 16.5 cm. longa saepe multo breviora ; lamina ad 14.5 cm. longa 6 cm. lata elongato-obovata, apice rotundata mucronata, margine late cartilaginea saepe purpurea, basi cordulata ; supra grisea cerae pellicula vestita ; subtus subfulva glaberrima costa media venisque primariis plus minusve rubidis ; petiolus ad 2 cm. longus ruber glaberrimus. Flores in racemo-umbellam circ. 12-floram dispositi, rhachi glauco-purpurea glabra ; pedicelli validi circ. 2 cm. longi glabri glauco-purpurei. Calyx magnus ad 1 cm. longus cupularis ultra medium 5-partitus extus glaber ; lobi ovati vel oblongo-ovales glabri striati post anthesin aucti. Corolla tubuloso-campanulata maculata et variculata carnosula 5-loba ; lobi rotundati lati emarginati circ. 1 cm. longi 2 cm. lati. Stamina corolla breviora ; filamenta glabra. Discus glaber. Gynaeceum corollam subaequans ; ovarium ovoideum truncatum sulcatum dense glandulosum ; stylus glaber. Capsula cylindrica circ. 2 cm. longa 7 mm. diam. glandulosa. Semina pallida elongata circ. 3 mm. longa .5 mm. lata.

several outer perulae half foliar with a broad red vaginal portion and upper green lamina gradually becoming more scale-like and acuminate ; intermediate broadly rounded firm red mucronulate quite glabrous ; innermost thinner and glutinous with colleters on back cemented to form the chamber for the foliage-leaves, on expansion submembranous carried up on the elongating shoot red foliaceous about 2.5 cm. long 6 mm. broad with an ovoid limb tapering upwards into a long acuminate point ending in a red hydathode and downwards into a broad petiole a little shorter than the limb ; young leaves dark purple with red venation revolute glabrous. Leaves shortly petiolate, at maturity as much as 16.5 cm. long but often less sometimes only about one-third that length ; lamina thickly leathery obovate typically with the outline of a jargonelle pear, the shorter leaves sometimes only oblong as much as 14.5 cm. long 6 cm. broad, apex rounded often truncate and retuse in the middle with a stout tuberculate red mucro, margin broadly cartilaginous entire, often purple-red, base cordulate ; upper surface coated with a grey thin pellicle of wax (soluble in benzole) covering a bright green or purple reddish foveolate surface, midrib and primary veins (about 15 on each side very regular and ascending) slightly grooved under the wax-pellicle ; under surface in the leaves with green upper surface tawny green, in leaves with red upper surface tawny, elevated midrib and primary veins (not raised) red tinted the whole surface most glabrous and smooth but in dry state ultimate venation sometimes appearing as a slightly raised reticulum ; petiole broad red and glaucous as much as 2 cm. long usually less, grooved without hairs or glands. Flowers in a terminal many-flowered shortly racemose umbel, as many as 12 flowers in the umbel, rhachis dark purple glabrous as much as 1.5 cm. long ; bracts and bracteoles unknown ; pedicels stout about 2 cm. long dark red-purple glaucous glabrous expanding into the cup of the calyx. Calyx cupular-campanulate about 1 cm. long 5-lobed ; cup somewhat fleshy glabrous 2-3 mm. long ; lobes subcrustaceous ovate or oblong-oval with rounded tip striate and glabrous persistent and enlarging around fruit. Corolla tubular-campanulate faintly spotted posteriorly and with a median basal blotch about 4.5 cm. long somewhat fleshy ; tube in narrow lower part one half length of corolla retuse and 5-pouched at base with darker blotch in each pouch, glabrous outside and inside, expanding into a broad spreading 5-lobed limb ; lobes broad rounded emarginate about 1 cm. long 2 cm. broad. Stamens shorter than corolla and gynaeceum ; filaments glabrous. Disk glabrous. Gynaeceum about as long as corolla ; ovary stout ovoid grooved truncate densely glandular with ovoid red-stalked glands with wax bloom between the glands ;

style stout glabrous expanding into a conspicuous lip below the lobulate stigma. Capsule cylindric about 2 cm. long 7 mm. in diameter shallowly grooved more or less glandular or with traces of glands sticky more or less enclosed by the enlarged hardened calyx, dehiscing by 5 valves from the apex style often persistent after dehiscence. Seeds pale-coloured elongated about 3 mm. long about .5 mm. in diameter with a chalazal and a funicular fringed crest.

Yunnan. [Without precise locality.] Duplicate in fruit. G. Forrest. No. **14,804.** Sept. 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 13,000 ft. In rhododendron thickets. Shrub of 6–8 ft. In fruit. G. Forrest. No. **14,485.** July 1917.

Yunnan. [Without precise locality.] Duplicate in fruit. G. Forrest. No. **15,298.** Nov. 1917.

Yunnan. [Without precise locality.] Duplicate in fruit. G. Forrest. No. **17,475.** Nov. 1918.

A fine species from that home of good things, Ka-gwr-pw. The plant has more than one special feature of interest.

In the first place, the foliage is noteworthy—thick fleshy leaves the outline of which is exactly that of a jargonelle pear and with an ash-grey upper surface which is due to a thin pellicle of wax covering it everywhere. A little benzole or other solvent placed on the surface removes the wax and exposes the coloured leaf-surface beneath, which is also of interest. In most of the older leaves the surface is green but the veins are more or less reddened; the young leaves are red all over and this red colour may be retained more or less in the older leaves and show on removal of the wax. Another feature of the foliage deserves notice. The young leaves on the annual shoots elongating after flowering and from below the inflorescence in all the specimens available for examination produce leaves much smaller than those on the older branches and more oblong in character. No one of the lateral twigs on branches now passed into fruit has leaves of the size and shape of the mature leaves on the flower-bearing shoots, and we must assume therefore that the growth of the leaves is much prolonged and that only towards the end of the season of each annual shoot do its leaves take on their adult character.

Then in the flower we have to note that the ovary is densely glandular but the style is wholly glabrous. The plant does not leave us in doubt about its affinity. It is one of the Thomsoni series using that term in its widest sense as I explained it in a previous number of these Notes.* This glandular ovary

* Notes R.B.G. Edin., x (1918), 98.

associated with a glabrous style belongs to forms aggregating around *Rh. selense*, Franch. in what we have called the Selense series, but the other characters of our plant are much more those of *Rh. Thomsoni*, Hook. f. and its Chinese form *Rh. cyanocarpum*, Franch. of the Thomsoni series in its restricted sense. And so *Rh. eclecteum* may be cited as additional evidence in support of the view that natural relationships are best expressed by grouping together in one rather than by segregating into three series the plants which have been placed in the series Campylocarpum, Selense, and Thomsoni (in limited sense) respectively. In this connection should be mentioned *Rh. Meddianum*, G. Forrest, a new species (see p. 136) from the Shweli-Salween divide and the nearest ally of *Rh. eclecteum*. It is in fact the southern form of the phylum which finds northern representation in *Rh. eclecteum*. *Rh. Meddianum* has the same type of leaf with ash-grey wax pellicle as occurs in *Rh. eclecteum* but it does not produce glandular shoots and its less glandular character extends to the gynaeceum of which the ovary and style are alike glabrous. Glands mark the species of the north; are absent from the species of the south. The species are separable at sight. And the absence of glands on ovary and style makes *Rh. Meddianum* an orderly member of the Thomsoni series in the limited sense.

Of *Rh. eclecteum* Forrest did not collect specimens in full flower so far as his collection shows. He obtained abundant fruit and seed and we shall have therefore the plant in cultivation ere long. The only corollas I have seen are imperfect withered ones on No. 15,298 hanging on some flowers beginning to pass into fruit. The specimen on which these occur is a small one taken out by Forrest from the mass of specimens under this number which now lie at the bottom of the sea somewhere between Britain and China having gone down in a steamer torpedoed during the war. We do not yet know the flower-colour of the plant. The description I have given is open therefore to correction and improvement when perfect flowers are available. Of the distinctness of the species there is no doubt.

Rhododendron erileucum,* Balf. f. et Forrest.† (Triflorum.)

A twiggy shrub as much as 2.7 m. high. Branches of the year about 1 mm. in diameter reddened densely lepidote epilose, a year old as much as 3 mm. with a glaucous bloom from epidermal wax-papillae the peltate scales somewhat wart-like,

* *ἐριλευκός*, very white—in allusion to the under-side of the foliage leaves.

† *Rhododendron erileucum*, Balf. f. et Forrest.—Frutex ad 2.7 m. altus. Rami hornotini rubidi dense lepidoti epilosi ceri-glauci, annotini verruculosi. Alabastra pauca. Folia petiolata ad 7.5 cm. longa; lamina chartacea ovalis vel obovalis

becoming grey before decorticating in subsequent years. No prominent cluster of buds at end of shoots, terminal foliage-bud often alone conspicuous, axils of adjacent leaves usually without large buds, few foliage-buds under the inflorescence elongating; outer scale-leaves crustaceous brown rounded to ovate keeled and more or less mucronate, lepidote and wax-glaucous on back, margin more or less ciliate; inner scale-leaves membranous brown oblong-spathulate about 1.2 cm. long one-nerved obtuse or rounded or truncate lepidote on back sparingly ciliate and setulose on margin top more densely ciliate; juvenile leaves conduplicate-convolute glabrous on upper surface excepting puberulous midrib, lepidote beneath with white seal-like scales and puberulous along midrib and primary veins, margin ciliate and setulose. Leaves petiolate as much as 7.5 cm. long; lamina thinly leathery oval or oboval as much as 7 cm. long 3 cm. broad, shortly acuminate at apex with a pronounced stylar apiculus ending in a red tuberculate hydathode, margin cartilaginous notched at the insertions of fallen setae and hairs, some setulae may persist for a time towards the base, base obtuse; upper surface opaque pale green elepidote, midrib grooved puberulous usually reddened, primary veins about 10 on each side more or less hidden; under surface wax-white covered all over with epidermal wax-bearing papillae, discontiguously lepidote the brown scales with convex umbo and equally broad fringe sometimes overlapped by the wax papillae, distance between the scales greater than diameter of scales which are about 2 in a square mm., midrib raised puberulous sparingly lepidote, primary veins very slightly raised and puberulous; petiole about 5 mm. long red-tinted grooved glaucous and puberulous and lepidote sometimes with a few setae. Inflorescence a 3–4-flowered umbel somewhat immersed within the end-leaves of the shoot; bracts early deciduous, unknown; bracteoles linear throughout or expanded into a spathulate top over 1 cm. long slightly longer than pedicel, only slightly hairy throughout and sparingly lepidote on back at top where is a

breviter acuminata apiculata, margine cartilaginea minute crenulata nunc plus minusve ciliata et setulosa, basi obtusa; supra pallide olivacea glabra (costa media sulcata puberula excepta) venis occultis; subtus albida papillis ceriferis ubique obtecta lepidota squamis spadiceis distantibus, costa media elevata puberula; petiolus ad 5 mm. longus sulcatus puberulus glaucus nunc setulosus. Flores in umbellas 3–4-floras dispositi; bracteolae pedicellis longiores; pedicelli sparsim lepidoti glauci epilosi vix 1 cm. longi. Calyx brevis 1.5 mm. longus lobis 5 minutis rotundatis margine sparsim setulosis et lepidotis. Corolla alba zygomorpha circ. 3.2 cm. longa a basi infundibuliformis late expansa intus puberula, extus puberula et lepidota; lobi 5 elliptici vel ovales circ. 1.7 cm. longi 2 cm. lati subaequales patentes. Stamina 10 inaequalia corolla breviora; filamenta puberula. Discus puberulus. Gynaeceum corolla brevius staminibus longius; ovarium conoideum truncatum lepidotum ad 4 mm. longum; stylus glaber sub stigmate lobulato discoideo claviformis.

long bristle-crest ; pedicel short usually barely 1 cm. long sometimes a little longer glaucous sparingly lepidote more densely so at expanded top under calyx. Calyx small about 1.5 mm. long with 5 rounded lobes each under 1 mm. in length, lepidote outside the margins of the lobes sparingly setulose and often scale-fringed. Corolla white open butterfly-shaped a little over 3 cm. long ; tube funnel-shaped from the base hardly laterally compressed with one shallow median inside groove on the posterior petal scarcely forming a ridge outside, base barely gibbous, puberulous inside, puberulous and lepidote all over outside, expanding into a broad 5-lobed spreading limb ; lobes broad elliptic about 1.7 cm. long 2 cm. broad auriculately overlapping subequal. Stamens 10 unequal shorter than corolla, longest about 2.7 cm. long with anther about 3 mm. long, shortest about 1.3 cm. long with anther about 2 mm. ; filaments dilated downwards glabrous at very base then puberulous to above the ovary. Disk shortly puberulous. Gynaeceum about 2.8 cm. long shorter than corolla ; ovary conoid truncate grooved about 4 mm. long, densely covered with imbricate peltate scales ; style glabrous expanding clavately under the broad discoid lobulate stigma.

W. Yunnan. Shweli-Salween divide. Lat. 25° 30′ N. Alt. 9000–10,000 ft. Open rocky slopes. Shrub of 6–9 ft. Flowers white. G. Forrest. No. **17,593.** May–June 1918.

This species is a near ally of *Rh. zaleucum*, Balf. f. et W. W. Sm. in the Triflorum series, and if it be hardy will be an acquisition as a plant of the garden. *Rh. zaleucum* coming from the same latitude and as low an altitude is hardy and gives hope therefore that *Rh. erileucum* will be so. By its broader oval or oboval shortly acuminate not lanceolate longly acuminate leaves *Rh. erileucum* is readily distinguished from *Rh. zaleucum*. Our specimens show it to be less floriferous than that species and also less inclined to branch freely from below the flower-truss. Most of the shoots show only small subfloral leaf-buds and the trusses are always solitary. The puberulous outside surface of the corolla may also be taken as a conspicuous difference between the species if it be a constant character but of this I am not satisfied. *Rh. erileucum* adds another to the number of species of the Triflorum series known from Western Yunnan where up till now explorers have not shown it to be abundantly represented.

Rhododendron erythrocalyx, Balf. f. et Forrest.* (Selense.)

Twiggy shrub about 2.5 m. high with thin straight branches about 3 mm. in diameter when a year old, the annual growths

* *Rhododendron erythrocalyx*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus ramulis tenuibus virgatis paucis strictis plus minusve rubro-glandulosis. Alabastra

about 7 cm. long. Branches of the year dark purple densely glandular some long almost setulose glands with stalks orange-coloured the gland ovoid dark red many shorter often nearly sessile globose and ovoid red glands, mixed with glands are occasional red sebaceous hairs, after the first year branches pass through brown to grey (decorticating) and the glands disappear leaving vestigial punctulations. Foliage-buds long fusiform pointed; outer scale-leaves crustaceous brown rounded mucronulate almost glabrous outside the margin shortly ciliate especially at top with greasy short hairs, followed by oblong ones more or less puberulous and floccose outside and with many marginal greasy red hairs clustered particularly at top and around the mucro; innermost scale-leaves long membranous yellow as much as 4.5 cm. long 6 mm. broad with linear-lanceolate lamina acuminate and tapering downwards into a petiole glandular on the back at base and more or less glandular on margin throughout, puberulous on back towards top and with clustered red greasy hairs around the elongated blunt mucro; young foliage-leaves revolute sparingly glandular on upper surface densely covered with orange cauliflower hairs on under surface with some glands on the midrib, petiole densely glandular like stem. Leaves petiolate as much as 12.5 cm. long 5–7 at the extremity of each shoot; lamina thinly leathery oval or elongated oval or oblong-oval, sometimes slightly broader above the middle as much as 10 cm. long 5 cm. broad, apex rounded or obtuse with a beaked tip or an apiculus ending in a rather small red tuberculate hydathode, margin thin cartilaginous obscurely notched through the fallen juvenile glands and hairs, base cordulate; upper surface olive-green mat shagreened glabrous but for vestiges of juvenile glands, midrib grooved, primary veins about 14 on each side slightly grooved; under surface paler covered all over with vestigial cauliflower

fusiformia; perulae extimae coriaceae rotundatae eglandulosae, intimae elongatae ad 4.5 cm. longae 6 mm. latae anguste lanceolatae acutae deorsum in petiolum attenuatae basi dense glandulosae; folia juvenilia revoluta. Folia ad 12.5 cm. longa ramulorum apicem versus 5–7 aggregata; lamina tenuiter coriacea ovalis vel oblonga vel oblongo-ovalis subrostrata, margine cartilaginea obscure crenulata, basi cordulata; supra olivacea glabra sed vestigiis glandularum obscure notata, costa media sulcata; infra pallidior ubique pilis caulifloris obtecta, costa media roseo-tincta elevata; petiolus circ. 2.5 cm. longus rubidus sulcatus plus minusve glandulosus. Umbella terminalis 4–6-flora; pedicelli ad 2.5 cm. longi glandulosi. Calyx ruber circ. 7 mm. longus; cupula carnosula atropurpurea dense glandulosa; lobi 5 circ. 5 mm. longi elongato-triangulares apice rotundati margine glandulosi et sparsissime ciliati utrinque eglandulosi sed pilis caulifloris paucis obscure conspersi. Corolla flavido-alba postice variculosa et maculata aperte campanulata circ. 5 cm. longa intus extusque glabra; lobi 5 rotundati circ. 2.5 cm. longi et lati emarginati. Stamina 10 inaequalia corolla multo breviora; filamenta glabra. Discus glaber. Gynaeceum corolla paullo brevius staminibus longius; ovarium cylindrico-conoideum truncatum dense glandulosum; stylus glaber.

hairs, midrib raised pink-tinted with some vestigial glands and cauliflower hairs but glabrescent, primary veins and ultimate venation showing as a very fine faintly red-tinted network ; petiole as much as 2.5 cm. long red-tinted grooved above glandular like the stem. Umbels 4–6-flowered terminal ; bracts and bracteoles early deciduous unknown ; pedicels reddened about 2–2.5 cm. long densely glandular like the stems with long and short glands. Calyx red about 7 mm. long with fleshy darker-coloured cup about 2 mm. long densely glandular outside and 5 elongated triangular persistent lobes about 5 mm. long rounded at top with a glandular margin a few hairs mixed with the glands, eglandular on both surfaces but with a few small white cauliflower hairs. Corolla creamy white with a basal pale crimson blotch posteriorly and some small crimson spots openly campanulate from the base about 5 cm. long glabrous outside and inside ; limb broad expanded ; lobes 5 rounded as much as 2.5 cm. long and broad emarginate. Stamens 10 shorter than corolla and gynaeceum unequal longest about 3.5 cm. long shortest about 2 cm. ; filaments widened to the base glabrous (occasionally a hair or two). Disk glabrous. Gynaeceum a little shorter than the corolla ; ovary cylindric-conoid truncate shallowly grooved densely glandular about 5 mm. long ; style glabrous slightly expanding at tip into a lip around the discoid lobulate stigma.

N.W. Yunnan. Bei-ma-shan. Alt. 13,000 ft. Lat. 28° 12′ N. Open thickets and pine forests. Shrub of 6–7 ft. Flowers creamy white with a few crimson spots and lines towards base. G. Forrest. No. **13,989.** June 1917.

A large-leaved member of the Selense series producing large creamy-white flowers with a red glandular calyx and corolla marked by a basal red blotch and small red spots spread widely over the posterior surface—characters which separate it in its series from allied forms.

U893 **Rhododendron fulvoides,** Balf. f. et Forrest.* (Fulvum.)

Shrub 6 m. high. Branches stout when a year old as much as 7 mm. in diameter densely covered with a brown scurfy whitening indumentum of mop-hairs more or less agglutinated and falling off, the older branches nearly bare of indumentum before

* *Rhododendron fulvoides*, Balf. f. et Forrest.—Frutex 6 m. altus. Rami crassi ad 7 mm. diam. indumento furfuraceo brunneo sed albicante tomentosi. Alabastra subglobosa. Folia petiolata ad 21 cm. longa sub anthesi deflexa ; lamina coriacea ad 19 cm. longa 6 cm. lata oblanceolata vel elongato-obovalis, apice rotundata vel obtusa vel subacuta vel breviter acuminata mucronata, margine plana, basi obtusa vel late cuneata ; supra olivacea subnitens glabra sed vestigiis indumenti juvenilis nunc notata, costa media et venis primariis (utrin-

decorticating. Foliage-buds enwrapped in a brown tomentum short subglobose nested amidst the leaves the last leaves a little smaller than the others and close up to the bud ; outer scale-leaves almost woody from a rounded or ovate basal half or third acuminately tailed thick keeled and mucronate, intermediate crustaceous more oblong less tomentose except on margins, innermost somewhat membranous and strap-shaped as much as 3.5 cm. long 3.5 mm. broad acute strongly mucronate and very tomentose about the mucro, finely ciliate throughout ; young leaves revolute with upper surface densely floccose glandular. Leaves petiolate as much as 21 cm. long ; lamina thickly leathery oblanceolate or elongated oboval as much as 19 cm. long 6 cm. broad, apex rounded or obtuse or subacute or shortly acuminate ending in a red tuberculate mucro, margin cartilaginous plane, base obtuse or broadly wedge-shaped ; upper surface olive-green somewhat glossy smooth glabrous hardly showing traces of juvenile indumentum, midrib and primary veins (about 16 on each side) grooved ; under surface covered with a brown coarsely granular surface of indumentum appearing as if produced by the cracking of a uniform layer, through the cracks and here and there where rubbed a paler very smooth pellicle seen, the indumentum is bistrate, the upper buff layer of mop-hairs or besom-hairs with long stout many-celled stalks crowned with a dense tuft of short pointed unicellular radiating branches usually curled, near to and on sides of midrib the stalks often very long and wavy, the mops often set in depressions or pits of the leaf-surface, the hairs of the tuft usually reddening and taking on a glandular look, the under stratum consists of similarly formed hairs only with very short or almost no stalks their branches spreading usually uncoloured and somewhat agglutinate to form the pellicle, midrib elevated clad like rest of surface, the primary veins hidden by indumentum ; petiole stout grooved about 2 cm. long clad like the stem. Flowers in solitary terminal as many as 20-flowered racemose umbels, rhachis up to 1.5 cm. long glabrous ;

secus ad 16) *sulcatis* ; **subtus** brunnea crasse granulosa indumento bistrato e pilis longis et brevibus in modum peniculi capitatim-floccosi constructis vestita ; petiolus circ. 2 cm. longus furfuraceo-tomentosus. Flores in racemo-umbellam terminalem circ. 20-floram dispositi, rhachi glabra ; inflorescentiae gemma globosa ; bracteae exteriores rotundatae glandulosae, interiores sericeae ; bracteolae lineares apice spatuliformes circ. 1 cm. longae ; pedicelli glabri circ. 2 cm. longi. Calyx minutus circ. 1 mm. longus glaberrimus vix 5-denticulatus. Corolla alba roseo-suffusa variculata et maculata campanulata circ. 3 cm. longa extus intusque glabra ; lobi 5 rotundati emarginati circ. 1.3 cm. longi 2 cm. lati. Stamina 10 inaequalia corolla gynaeceoque breviora ; filamenta basi subglandulosa et vesiculoso-pilosa. Discus glaber vel sparsissime puberulus. Gynaeceum corollam subaequans ; ovarium angustum ad 7 mm. longum truncatum glaberrimum ; **stylus glaber.**

inflorescence-bud globose; outer bracts crustaceous brown rotundate more or less glandular and floccose outside; inner bracts oblong broadly spathulate densely silky outside; bracteoles linear expanded into a spoon-shaped tip, about 1 cm. long, shortly pilose below at top densely pilose and hair-crested; pedicel about 2 cm. long glabrous. Calyx saucer-shaped very small about 1 mm. long most glabrous its margin undulate and showing obscurely 5 teeth or semilunate lobes. Corolla white flushed rose with a large crimson basal blotch and a few spots or lines spreading from it campanulate about 3 cm. long glabrous outside and inside expanding into a 5-lobed open limb; lobes rounded about 1.3 cm. long 2 cm. broad emarginate. Stamens 10 unequal all shorter than corolla and gynaeceum; longest about 2.3 cm. long, shortest about 1.3 cm. long; filaments slightly dilated downwards, at the base clad with short vesicular hairs and stalked glands; anthers about 2 mm. long. Disk glabrous or most sparsely puberulous. Gynaeceum about 3 cm. long equalling corolla; ovary thin elongated 7 mm. long 1.5 mm. in diameter truncate slightly grooved most glabrous; style glabrous expanded at top into a short lip below the discoid lobulate stigma. Capsule sickle-shaped long and thin as much as 3.5 cm. long 4 mm. in diameter glabrous, style often persistent, dehiscing from apex by 5 valves. Seed pale brown oblong flattened striate about 2.5 mm. long .75 mm. broad with a narrow arillar wing on one side usually and a funicular and chalazal crest.

N.W. Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 11,000 ft. In mixed thickets and amongst rocks. Shrub of 6–10 ft. In fruit. G. Forrest. No. **13,400.** Sept. 1914.

N.W. Yunnan. Mekong-Salween divide. Lat. 28° 10′ N. Alt. 11,000 ft. In open forests. Shrub of 15 ft. G. Forrest. No. **13,556.** Oct. 1914. [Foliage only.]

S.E. Tibet. Tsarong. Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. In rhododendron thickets. Shrub of 10 ft. In fruit. G. Forrest. No. **14,988.** Oct. 1917.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N. Alt. 12,000 ft. In open thickets. Shrub of 6–9 ft. Flowers rose? In fruit. G. Forrest. No. **14,499.** July 1917.

S.E. Tibet. Tsarong. G. Forrest. No. **15,278.** Nov. 1917. Duplicate in fruit?

Yunnan. [Without precise locality.] G. Forrest. No. **16,140.** Nov. 1917. Duplicate in fruit.

Eastern N.W. Yunnan. Mountains N.E. of Chungtien. Lat. 28° N. Alt. 13,000 ft. In rhododendron thickets. Shrub of 9–12 ft. Flowers creamy rose with a few crimson markings and blotch of deep crimson. G. Forrest. No. **16,515.** July 1918.

S.E. Tibet. Tsarong. On Doker-la, Mekong-Salween

divide. Lat. 28° 25′ N. Alt. 12,000–13,000 ft. In pine and rhododendron forest. Shrub of 20 ft. Flowers white flushed rose and with crimson markings running into a deep blotch at base. G. Forrest. No. **16,516.** June 1918.

S.E. Tibet. Tsarong. On Kw-gwr-pw, Mekong-Salween divide. Lat. 28° 40′ N. Alt. 12,000 ft. In rhododendron thickets and pine forests. Shrub of 10–15 ft. Flowers pinkish-rose with a few crimson markings at base. G. Forrest. No. **16,720.** July 1918. Duplicate of 1917 in fruit.

S.E. Tibet. Tsarong. G. Forrest. No. **16,721.** Aug. 1918. Duplicate of 16,720 in fruit.

N.W. Yunnan. Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 12,000 ft. Open situations amongst boulders. Shrub of 6–7 ft. In fruit. G. Forrest. No. **12,967.** Aug. 1914.

N.W. Yunnan. Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 12,000 ft. In open dark forests. Shrub of 15 ft. In fruit. G. Forrest. No. **13,029.** Aug. 1914.

The type of the Fulvum series, *Rh. fulvum*, Balf. f. et W. W. Sm. is a plant of the Shweli-Salween divide in latitudes from 25° 20′ N. to 25° 30′ N. as we know of it up till now. This new species *Rh. fulvoides* we must look on as a geographical form of the Fulvum type from the Mekong-Salween divide having a wider range over areas between latitudes 28° 10′ N. and 28° 40′ N. From the Kari Pass on the Mekong-Yangtze divide in lat. 27° 40′ N. Forrest has brought specimens in immature fruit which I do not separate from *Rh. fulvoides*, and on the mountains N.E. of Chungtien in lat. 28° N. close to the Eastern boundary of N.W. Yunnan Forrest found a plant of this phylum which seems to be also this *Rh. fulvoides*. These extensions of the distribution out of the Mekong-Salween divide find a parallel in species of other phyla of Rhododendron and also in other genera.

Rhododendron hemitrichotum,* Balf. f. et Forrest.† (Scabrifolium.)

Small twiggy bush nearly 1 m. high with very thin intricately interlacing softly and shortly downy branchlets, profusely floriferous. Branches a year old about 1 mm. in diameter pink and densely coated with short straight erect soft white hairs intermixed with mushroom-like small peltate scales the disk of

* *ἡμιτρίχωτος*, half hairy—in allusion to the disposition of hairiness on leaf-surfaces.

† *Rhododendron hemitrichotum*, Balf. f. et Forrest.—Frutex nanus virgatus ad 1 m. altus. Rami tenues (annotini circ. 1 mm. diam.) pallide rosei puberuli et lepidoti. Alabastra parvula; perulae lepidotae plus minusve arachnoideo-ciliatae. Folia petiolata ad 2.5 cm. longa; lamina coriacea anguste oblonga vel lanceolata, acuta ad 2.2 cm. longa 6 mm. lata, margine revoluta, basi cuneata;

which without fringe is often nearly globular and infiltrated with an orange secretion sometimes reddening at the umbo of the scale, hairs and scales traceable on the dark grey or blackened older branches for many years. Foliage-buds very small ovoid blunt usually invested by one or two reduced foliage-leaves which are about 4 mm. long with lanceolate pointed lamina and vagina equally long; outer scale-leaves thinly crustaceous deciduous at bud-expansion rounded lepidote and puberulous outside and with long curled arachnoid marginal hairs spreading over the bud, a few straight short hairs present about the mucronulate tip; innermost scale-leaves membranous obovate keeled obtuse slightly mucronate about 7 mm. long 2 mm. broad densely lepidote outside finely ciliate; young leaves conduplicate convolute. Leaves shortly petiolate as much as 2.5 cm. long; lamina leathery narrowly oblong or lanceolate sometimes a little wider above the middle, about 2.2 cm. long, 6 mm. broad acute with a short red mucro, margin cartilaginous recurved, base wedge-shaped; upper surface pale olive-green mat with a grooved midrib and all over persistently puberulous with soft short hairs which do not harden to form asperities near the margin, primary veins invisible; under surface grey-white with a raised pink-tinted sparsely puberulous elepidote (or with an occasional scale) midrib, the rest of the surface on which primary veins do not show lepidote with small discontiguous orange-coloured scales having short stalk and convex swollen disk without fringe sunk in pits to depth of half of the disk, distance between scales slightly greater than or about equal to diameter of scales which are some 9 to the sq. mm. sometimes in groups touching one another, epidermal papillae in intervals between scales large rod-like; petiole about 3 mm. long grooved puberulous and lepidote. Flowers disposed in 2–3-flowered umbels which are axillary to the last fully developed leaves on the shoots, 3–4 umbels forming a cluster at the end of each shoot which ends in a vegetative bud; bracts persistent under the flowers; outer bracts crustaceous rounded puberulous and ciliate outside the margin with long woolly spreading hairs mixed with short

supra convexa pallide olivacea opaca ubique puberula elepidota; subtus albo-grisea papillis epidermicis ceriferis vestita epilosa (costa media elevata sparsim puberula excepta) et squamis peltatis discontiguis stipitatis subglobosis (sine instita) aurantiacis in foveis profundis inclusis obsita; petiolus circ. 3 mm. longus pallide roseus lepidotus et puberulus. Umbellae 2–3-florae omnes axillares circum ramulorum apicem 3–4-fasciculatae; bracteae persistentes pilosae et lepidotae; bracteolae filiformes apiceque expansae pedicellis longiores; pedicelli rubri circ. 6 mm. longi puberuli et lepidoti. Calyx minutus vix 1 mm. longus lepidotus et puberulus. Corolla pallide rosea circ. 1.3 cm. longa; tubus infundibuliformis intus glaber; lobi 5 oblongo-ovales circ. 7 mm. longi 4 mm. lati extus lepidoti. Stamina 10 inaequalia, longissima corollam paullo superantia; filamenta puberula. Discus glaber. Gynaeceum corolla longius circ. 1.5 cm. longum; ovarium parvum circ. 2 mm. longum puberulum et lepidotum; stylus glaber ruber.

straight ones, inner fertile bracts obovate spathulate apex rounded with broad base about 6 mm. long 3 mm. broad puberulous and lepidote outside with long woolly marginal hairs mixed with short ones; bracteoles longer than pedicels and calyx about 8 mm. long filiform below and glabrous at base pilose upwards and expanded at end into an oval limb woolly and lepidote; pedicels short 6 mm. long sometimes longer to about 8 mm. red lepidote and puberulous. Calyx minute not 1 mm. long red lepidote and puberulous outside the rim undulate or with five indications of rounded lobation, the lobes ciliate with short hairs a few long ones mixed with them. Corolla pale rose margined a deeper shade about 1.3 cm. long slightly shorter than longest stamens and gynaeceum with a short funnel-shaped tube glabrous inside expanding into an erect 5-lobed limb; lobes oblong-oval about 7 mm. long 4 mm. broad lepidote outside. Stamens 10 unequal longest just exceeding the corolla, shortest barely 1 cm. long; filaments filiform glabrous at very base finely puberulous above that to mouth of corolla-tube. Disk glabrous. Gynaeceum about 1.5 cm. long longer than corolla and stamens; ovary small barely 2 mm. long conoid truncate lepidote and puberulous; style filiform glabrous pink with a very small lobulate stigma.

S.W. Szechwan. Mu-li Mountains. Valley of the Litang River. Lat. 28° 12′ N. Alt. 12,000 ft. Open rocky pasture. Shrub of 2–3 ft. Flowers pale rose margined a deeper shade. G. Forrest. No. **16,250.** June 1918.

Rh. hemitrichotum is a plant of the facies of *Rh. mollicomum*, Balf. f. et W. W. Sm. and is a more northerly development of the same phylum in the Scabrifolium series. It may be at once recognised by the white under side of the foliage-leaves—the coloration is due to wax-coloured elongated rod-like papillae—and the absence of hairs on this surface except for a few on the midrib. In *Rh. mollicomum* the surface is green and downy. The features exhibited by the peltate scales deserve notice. These scales on the leaf under side have stout stalks and the disk is ovoid transversely to the stalk, sometimes almost globular. There is no fringe. The scales are sunk in deep pits so that only about half of the disk is above the surface.

3845 **Rhododendron hormophorum,*** Balf. f. et Forrest.† (Triflorum.)

A woody small shrub or undershrub some 4 dm. high with thick woody underground or prostrate rooting stems forming

* ὅρμος, necklace—in allusion to the circlet of bead-like scales around the calyx-rim.

† *Rhododendron hormophorum*, Balf. f. et Forrest.—Suffruticosum ad 4 dm. altum ramulis plurimis a caulibus subterraneis vel prostratis orientibus. Ramuli

crowns from which many short branches ascend. Aerial branches about 3 mm. in diameter the bark becoming grey and cracking in the third year usually. Twigs of the year very thin barely 1 mm. in diameter reddened finely puberulous and sparingly lepidote with white seal-like peltate scales distant or in groups, the scales falling from older twigs some remaining and blackening, the puberulousness persistent until decortication. Foliage-buds small ovate ; outer scale-leaves crustaceous rounded obtuse glabrous outside, except at the tip which is finely hair-ciliate, puberulous more or less inside ; innermost scale-leaves pale greenish or yellowish membranous spathulate-ligulate somewhat acute carried up on elongating axis lepidote outside margin more or less setulose ; juvenile leaves conduplicate-convolute densely setulose and puberulous and with a few peltate scales on upper surface, densely lepidote underneath with a puberulous midrib, margin densely setulose-ciliate, petiole grooved puberulous more or less lepidote and setulose-ciliate. Leaves petiolate as much as 4.5 cm. long ; lamina thin papery lanceolate or oblong or narrowly oblong-oval as much as 4.2 cm. long 1.5 cm. broad acute or obtuse and ending in a prominent apiculus with rounded tuberculate terminal red hydathode, margin plane not cartilaginous regularly and finely ciliate somewhat setulose towards base, base cuneate tapered into the short petiole ; upper surface mat olive-green smooth puberulous and distantly lepidote and setulose, the scales white flat seal-like with broad umbo and narrower entire fringe intervals between scales much greater than diameter of scale, about 2 or 3 scales in a square mm., midrib reddened lepidote and setulose, primary veins very thin immersed reddened about 7 on each side of midrib ; under surface slightly paler lepidote with distant scales like the upper surface, esetulose and epilose except on raised reddened midrib which has very short hairs, primary veins and ultimate venation reddened ; petiole 2–3 mm. long finely puberulous sparingly

hornotini tenues vix 1 mm. diam. puberuli et discontigue albo-lepidoti, annotini ad 3 mm. diam. Folia breviter petiolata ad 4.5 cm. longa ; lamina tenuis papyracea lanceolata vel oblonga vel oblongo-ovalis acuta vel obtusa apiculata, margine plana haud cartilaginea ciliata et setulosa, basi cuneata ; supra opaca olivacea puberula et setulosa et lepidota squamulis distantibus ; subtus pallidior albo-lepidota squamis sigilliformibus distantibus, esetulosa et epilosa (costa media elevata excepta) ; petiolus 2–3 mm. longus puberulus et setulosus sparsim lepidotus. Umbellae 3–5-florae ; bracteolae pedicellis breviores dorso lepidotae ; pedicelli vix 1 cm. longi epilosi sparsim lepidoti. Calycis limbus undulatus parvulus margine squamis albis cinctus. Corolla zygomorpha circ. 3 cm. longa rosea brunneo-maculata, extus lepidota et puberula, intus puberula ; lobi 5 subaequales oblongi vel oblongo-ovati. Stamina 10 inaequalia corolla paullo breviora ; filamenta ad basim glabra supra usque ad os corollinum puberula. Discus puberulus. Gynaeceum corolla paullo longius ; ovarium cylindricum truncatum dense lepidotum ; stylus ruber glaber sub stigmate discoideo lobulato in labium parvulum circulare expansus.

lepidote and setulose. Flowers in 3–5-flowered terminal umbels ; bracts soon deciduous, unknown ; bracteoles short about 5 mm. long about .5 mm. broad strap-shaped lepidote outside, pilose and setulose on margin, hair-crested ; pedicels barely 1 cm. long strict divergent epilose sparingly lepidote reddened slightly expanded below the calyx. Calyx an undulate rim the protuberances fringed by large white peltate scales forming a conspicuous necklace-like ring below the corolla-tube. Corolla butterfly-shaped rose-coloured with brown spots posteriorly, about 3 cm. long puberulous inside, outside finely puberulous and with a few distant scattered white peltate scales ; tube short apparently darker than limb thin slightly compressed with a median ridge on back of posterior petal and corresponding groove inside otherwise not conspicuously grooved ; 5 lobes unequal antero-lateral longer and narrower, posterior 1.5 cm. long 1 cm. broad, oblong-oval or ovate obtuse often somewhat undulate. Stamens 10 unequal nearly equalling corolla, longest about 1.8 cm. long, shortest about 1.2 cm. long ; anthers small ovoid about 2 mm. long ; filaments dilated at base and there glabrous over about 2 mm., puberulous above to mouth of corolla-tube. Disk more or less puberulous. Gynaeceum longer than stamens and corolla about 3.3 cm. long ; ovary cylindric truncate grooved about 3.5 mm. long entirely covered by white imbricate peltate scales sometimes a few hairs at the top amongst the scales ; style red glabrous slightly swollen below the discoid lobulate stigma to which it forms a narrow crimson lip.

S.W. Szechwan. Mu-li Mountains. Valley of the Litang. Lat. 28° 12′ N. Alt. 11,000 ft. Open dry stony pasture. Shrub of 10–18 inches. Flowers rose with brown markings. Forrest. No. **16,265.** June 1918.

So many of the members of the Triflorum series are distinguished one from the other by characters which, easily recognisable in the living plant, lose prominence in the dried specimen, that it is refreshing to have in this new species from S.W. Szechwan a plant of which dried specimens pronounce at once specific differentiation. *Rh. hormophorum* belongs within the Triflorum series to the set including *Rh. chartophyllum*, Franch. and *Rh. yunnanense*, Franch. It is a plant the habit of which is in consonance with its described habitat—dry stony alpine pasture. Its stem appears to ramify in the soil under the stones, rooting and forming crowns from which aerial short shoots ascend, bare below and producing small tufts of leaves and trusses of flowers at the top. The community of such plants must form a scrub about a foot and a ha'f high after the fashion of old heather on a moor. The hairy bristly leaves have the hairs and bristles on the upper surface, whilst the under side has neither (excepting

the midrib). Then the hair-cilia and bristles of the margin are most regularly placed. The peltate scales are about equally distributed on the upper and under surfaces, and these, as on the stems and elsewhere where they occur, have the form of flat white disks recalling rather those of the Heliolepis series than of the Triflorums. In the flower the calyx gives a diagnostic mark utilised for the name of the species in the white peltate scales disposed close-set along the rim of the lobes forming a white necklace-like band around the base of the corolla which is finely puberulous all over outside. As a plant of cultivation *Rh. hormophorum* is likely to be hardy but does not give evidence of greater or less attractiveness than many others of its series.

3832 **Rhododendron hypophaeum,*** Balf. f. et Forrest.† (Triflorum.)

A shrub about 1.5 m. high with thin branches of short annual growths divaricating pseudo-dichotomously to form zigzag axes. Twigs a year old about 1 mm. in diameter (after 8 years some 4 mm. only) finely puberulous and lepidote distantly with orange-coloured small scales, older twigs blackish-grey. Foliage-buds not clustered on either vegetative or flower shoots small narrowly ovoid about 5 mm. long; outer scale-leaves crustaceous rounded

* *ὑπόφαιος*, somewhat grey—in allusion to the colour of foliage.

† *Rhododendron hypophaeum*, Balf. f. et Forrest.—Frutex ad 1.5 m. altus. Rami graciles divaricatim patentes minute puberuli lepidoti demum cinerascentes. Alabastra anguste ovoidea parva; perulae exteriores rotundatae vel late ovatae carinatae mucronulataeque extus sparsim puberulae ubique lepidotae ciliatae. Folia petiolata ad 6 cm. longa; lamina chartacea lanceolata vel ovali-lanceolata acuta, margine cartilaginea, basi late cuneata; supra olivacea opaca laevis discontigue lepidota et sparsim puberula, costa media sulcata puberula, nervis primariis utrinsecus circ. 7 fere occultis; subtus pallidior griseo-viridis copiose lepidota squamis discontiguis aurantiaco-brunneis, costa media straminea puberula lepidota, nervis primariis et venis ultimis leviter prominulis; petiolus circ. 5 mm. longus sulcatus puberulus et lepidotus. Umbellae 3–4-florae solitariae terminales vel 2–3-fasciculatae; bracteae exteriores rotundatae crustaceae lepidotae et albo-ciliatae, intimae fertiles oblongo-spathulatae vel subobovatae 1 cm. longae 6 mm. latae basi membranaceae erectae supra reflexae cucullatae extus lepidotae; bracteolae lineares pedicellis longiores lepidotae et pilo-cristatae; pedicelli 8 mm. longi copiose lepidoti epilosi. Calyx parvus circ. 1.5 mm. longus 5-lobus extus basi lepidotus; lobi membranacei rotundati ciliati circ. 1 mm. longi. Corolla alba roseotincta zygomorpha circ. 2 cm. longa extus elepidota epilosa intus puberula; tubus infundibuliformis lateraliter compressus postice bisulcatus in limbum apertum 5-lobum ampliatus; lobi subaequales circ. 1 cm. longi oblongo-ovales undulati. Stamina 10 inaequalia, longiora corollam aequantia brevissimum circ. 1 cm. longum; filamenta puberula; antherae purpureotinctae. Discus puberulus. Gynaeceum corolla multo longius circ. 2.7 cm. longum; ovarium parvum 2 mm. longum conoideum truncatum lepidotum; stylus validus glaber vel ad basim pilos paucos gerens sub stigmate haud dilatatus; stigma parvum. Capsula cylindrica circ. 1 cm. longa 3 mm. diam. lepidota.

or broadly ovate keeled mucronate sparingly puberulous outside and there lepidote all over, ciliate. Leaves petiolate as much as 6 cm. long; lamina chartaceous lanceolate or oval-lanceolate acute, margin cartilaginous plane, base broadly cuneate; upper surface mat olive-green smooth sparingly puberulous and discontiguously lepidote with small orange-brown scales showing a convex umbo and narrow uncoloured fringe, distance between the scales greater than diameter of scales which are about 7 in a sq. mm., midrib grooved puberulous, primary veins about 7 on each side straight hardly visible; under surface much paler grey-green with a pale yellow raised epilose lepidote midrib and the whole surface (dry) showing a slightly raised reticulation of venation, lepidote with orange-brown discontiguous scales separated usually by more than diameter of scale, scales about 10 in a sq. mm. rather larger than those of upper surface and with concave umbo; petiole about 5 mm. long straw-coloured lepidote and puberulous. Inflorescence a solitary terminal 3–4-flowered umbel; outer bracts rounded crustaceous lepidote outside ciliate, innermost bracts broadly spathulate about 1 cm. long 6 mm. broad reflexing outwards and downwards from middle lower half membranous broad upper half more crustaceous hooded and embossed outwards as a convex surface lepidote outside with incurved membranous margins; bracteoles about 1.2 cm. long longer than pedicels filiform below club-shaped above pilose throughout lepidote on back above, white hair-crested; pedicels short as much as 8 mm. long strict lepidote the pale yellow scales in groups epilose. Calyx small about 1.5 mm. long; cup about .5 mm. long lepidote outside 5-lobed; lobes often somewhat unequal about 1 mm. long rounded membranous above and ciliate hardly lepidote outside. Corolla white faintly tinged rose butterfly-shaped small about 2 cm. long, glabrous outside, finely puberulous towards base inside; tube compressed and grooved on each side of midrib of posterior petal correspondingly ridged inside expanding into a funnel-shaped 5-lobed limb; lobes oblong-oval undulate about 1 cm. long 7 mm. broad half the length of the whole corolla half-spreading. Stamens 10 unequal, longest about 2 cm. long equalling the corolla with anther 2 mm. long, shortest 1 cm. long gripped in the posterior corolline groove with anther 1 mm. long; filaments dilated downwards to the base which is glabrous over about 2 mm., puberulous above within the corolla-tube; anthers violet-tinted. Disk puberulous. Gynaeceum about 2.7 cm. long much longer than corolla and stamens; ovary small about 2 mm. long conoid truncate lepidote; style glabrous or with a few basal hairs, of equal diameter throughout not enlarged at tip and carrying a

small lobulate stigma at the centre of its extremity. Capsule about 1 cm. long 3 mm. in diameter dehiscing to base by 5 valves.

S.W. Szechwan. Mountains around Mu-li, valley of the Litang River. Lat. 28° 12′ N. Alt. 11,000 ft. Open situations in and on the margins of pine forests. Shrub of 4–5 ft. Flowers white faintly tinged rose. G. Forrest. No. **16,249.** June 1918.

Rh. hypophaeum is one of the small-flowered species of the Triflorum series, using that designation in its widest sense. Its nearest allies are *Rh. longistylum*, Rehd. et Wilson and *Rh. Hanceanum*, Hemsl.—two of Wilson's species from Szechwan, and both known in wild specimens in an imperfect condition. They are common plants now in cultivation and their features in living specimens are well known. *Rh. hypophaeum* is easily distinguished from both these species by its less leathery leaves smooth not rugulose on the upper surface and with closer-set scales on the under surface. Then the inflorescence is a few-flowered umbel solitary and terminal whilst in the species named the inflorescence is essentially racemose with many flowers although where there are only a few flowers the umbellate form appears.

Rhododendron Jenestierianum,* G. Forrest.† (Campylogynum.)

A stiffly branched shrub reaching 2 cm. in height with few straight divaricating thin branches simulating dichotomies. Twigs of the year purple with a glaucous bloom about 1.5 mm. in diameter, glabrous but occasionally a yellow discoid scintillating scale visible; a year old 2.5 mm. in diameter pale brown or grey not decorticating until the third or fourth year. Mature buds not seen; innermost scale-leaves membranous brown more or less carried up on elongating shoot, spathulate the uppermost petiolate 2.5–3 cm. long 8 mm. broad obtuse spar-

* To Père Jenestier of the French R.C. Tibetan Mission, Tsiedjong, Upper Mekong, I am indebted for much help freely rendered.—G. FORREST.

† *Rhododendron Jenestierianum*, G. Forrest.—Frutex ad 2 m. altus. Ramuli annotini glabri circ. 3 mm. diam. Folia petiolata ad 16.5 cm. longa; lamina papyracea lanceolata vel oblanceolata saepe curvata, apice breviter acuminata, margine integra, basi cuneata inaequalis; supra pallide viridis subnitens glabra (costa media puberula excepta); infra pallidior squamis peltatis scintillantibus distantibus conspersa et papillis ceriferis glauca, costa media venisque primariis prominulis; petiolus circ. 1.5 cm. longus. Flores subpenduli in racemos dispositi, rhachi glabra; pedicelli circ. 2.5 cm. longi plus minusve atropurpurei et ceriferi squamis paucis conspersi. Calyx cupuliformis circ. 3 mm. longus glaber rubropurpureus margine nunc integer nunc inaequaliter lobatus. Corolla campanulata atropurpurea cerifera glabra circ. 1.7 cm. longa. Stamina 8 corollam subaequantia; filamenta glabra crassa aurantiaca. Discus atropurpureus. Gynaeceum staminibus brevius; ovarium petasiforme lepidotum; stylus glaber deflexus ovarium dimidio superans, apice clavatus.

ingly lepidote outside from base upwards with yellow scintillating fleshy scales with a discoid summit, somewhat silky at top outside and inside and with a hair-crest, most minutely and shortly ciliate. Leaves in fives or sixes at the end of the twigs petiolate as much as 16.5 cm. long; lamina thin papery lanceolate or slightly oblanceolate sometimes laterally curved narrowed to both ends, apex shortly acuminate ending in a small inconspicuous hydathode, margin entire finely cartilaginous, base more or less wedge-shaped or obtuse often unequal; upper surface pale light green smooth slightly glossy with wax coating, in adult state glabrous but for a few hairs in the grooved midrib, primary veins about 16 on each side inconspicuous; under surface grey-green sprinkled with far distant small yellowish scintillating peltate scales each with a narrow umbo and broad sharply circular thick fringe the stalk sunk in surface pit, the intermediate areas clad with large wax-covered papillae which make a somewhat glistening surface and give the grey look to the surface, midrib and primary veins prominent straw-coloured the former obscurely puberulous; petiole grooved about 1.5 cm. long furfuraceous on upper surface glabrous underneath with an occasional peltate scale. Inflorescence an erect projecting small raceme of some 10–12 spreading somewhat drooping flowers, rhachis about 2.5 cm. long glabrous purple somewhat glaucous with wax; fertile bracts obovate leathery spathulate about 1.5 cm. long 8 mm. broad somewhat truncate mucronate densely lepidote and puberulous on back finely ciliate hair-crested; bracteoles linear strap-shaped a little wider at top about 1.5 cm. long, sparingly pilose throughout and sparingly lepidote outside in upper half hair-crested; pedicels about 2.5 cm. long more or less plum-coloured and with a glaucous bloom especially towards top where expanded under the calyx, glabrous but for a few scattered yellowish or whitish circular scales. Calyx a shallow fleshy cup about 3 mm. long plum-coloured with a glaucous bloom glabrous, margin thinner slightly reddened entire or obscurely undulate or unequally lobed somewhat spreading. Corolla campanulate fleshy plum-purple coloured about 1.7 cm. long with a glaucous bloom glabrous inside and outside; tube about 5 mm. wide at base and there paler-coloured; limb 5-lobed the lobes oval rounded at tip undulate 9 mm. long 7 mm. broad recurving at expansion. Stamens 8 alternately long and short, the short only slightly shorter, about equalling the corolla in length; filaments stout fleshy purple-red or bright crimson, not dilated downwards, glabrous; anthers purplish-red or bright crimson oblong large about 2 mm. long. Disk glabrous deep purple. Gynaeceum shorter than stamens; ovary dome-shaped

grooved about 3 mm. long lepidote with almost contiguous cake-like scales ; style stout glabrous deflexed about half again as long as ovary broadly clavate at the top and forming a flat-lipped disk to the lobulate stigma. Capsule small ovoid about 6 mm. long 5 mm. in diameter ash-grey with remains of scales and subtended by the withered calyx, dehiscing from apex by 5 valves. Seeds most minute brown fusiform.

N.E. Upper Burma. N'Maikha-Salween divide, Salween flank. Lat. 26° to 26° 8′ N. Alt. 11,000–12,000 ft. On the margins of forests, in cane brakes and on open rocky slopes. Shrub of 4–6 ft. Flowers plum-purple with a glaucous bloom. Anthers and filaments clear purplish-red or bright crimson. G. Forrest. No. **17,824.** April 1919. Duplicate in fruit No. **18,329.** Aug. 1919.

A charming plant with flowers recalling in appearance and construction those of some forms of the aggregate species *Rh. campylogynum*, Franch. But that is a dwarf species with small leaves and flowers on long pedicels solitary and terminal or in 3–4-flowered terminal trusses in which the stamens have hairy filaments. Here we have a large-leaved plant with refined foliage of a delicate grey-green tint and trusses of many flowers projected well above the leaves. Altogether a distinct species much to be desired for our gardens.

4895 **Rhododendron lepidostylum,** Balf. f. et Forrest.* (Trichocladum.)

Shrub with short thin annual branches, those of the year about 1 mm. in diameter densely hispid with bristle-hairs and lepidote beneath them with white stalked scales without fringe, bristles and vestiges of scales persisting more or less until decortication of the dark dirty-grey coloured cortex. Scale-leaves of the foliage-buds persisting for two years at least at the base

* *Rhododendron lepidostylum*, Balf. f. et Forrest.—Frutex ramulis brevibus tenuibus dense hispidis et lepidotis. Alabastrorum perulae plus minusve persistentes. Folia biennia petiolata ad 4.5 cm. longa ; lamina tenuiter coriacea ovalis vel obovalis ad 4 cm. longa 1.7 cm. lata, apice rotundata breviter mucronata, margine setulosa, basi obtusa vel rotundata ; supra olivacea opaca glaberrima ; subtus pallidior subglauca ubique plus minusve setulosa et discontigue lepidota ; petiolus circ. 5 mm. longus hispidus et lepidotus. Flores in umbellam 2-floram terminalem dispositi ; bracteae perulis similes ; bracteolae lineari-clavatae circ. 1 cm. longae superne lepidotae et setulosae ; pedicelli ad 3 cm. longi lepidoti et setulosi. Calyx circ. 7 mm. longus 5-partitus ; lobi oblongi vel lanceolati obtusi vel acuti lepidoti et dense setulosi. Corolla flavida maculata obliqua circ. 2.5 cm. longa extus puberula et lepidota, intus puberula, 5-loba ; lobi inaequales rotundati vel ovales integri. Stamina brevissima supra basim villosa. Discus glaber. Gynaeceum corolla paullo longius ; ovarium breve truncatum circ. 4 mm. longum dense lepidotum et setulosum ; stylus lepidotus ovario longior.

of the successive annual shoots; outer scale-leaves brown crustaceous keeled and mucronulate glabrous outside, intermediate longer oblong shortly ciliate densely lepidote outside, innermost greenish somewhat membranous narrowly oblong-oval obtuse and ciliate carried up on elongating shoot. Leaves of a year present when those of succeeding year are developed, petiolate as much as 4.5 cm. long; lamina thinly leathery oval or oboval as much as 4 cm. long 1.7 cm. broad, apex obtuse or rounded with short conspicuous red tuberculate mucro, margin setulose, base obtuse or rounded; upper surface olive-green mat with grooved midrib and primary veins about 8 on each side hidden most glabrous; under surface paler somewhat glaucous setulose all over copiously on the raised pinkish midrib (primary veins concealed) also densely lepidote with brown infiltrated superficial discontiguous concave nearly uniform scales without conspicuous fringe the distance between the scales less than or occasionally slightly more than diameter of scales about 4–5 scales in a sq. mm.; petiole about 5 mm. long clad like the stem. Flowers in a 2-flowered terminal umbel; bracts quite like the scale-leaves of the foliage-buds; bracteoles linear-clavate a little more than 1 cm. long lepidote towards top and setulose; pedicels as much as 3 cm. long green lepidote and bristly expanded into a cup below the calyx. Calyx large longer than ovary about 7 mm. long cut to the base into 5 green lobes; lobes unequal oblong or lanceolate obtuse or acute lepidote with large white scales outside and densely setulose all over back and margin. Corolla yellow spotted copiously posteriorly oblique about 2.5 cm. long, puberulous and lepidote outside, puberulous inside; tube in front short about 5 mm. long expanding into a broad limb with 5 unequal lobes, posterior lobe smallest rounded about 1 cm. long and broad, antero-lateral elongated oval about 1.5 cm. long 8 mm. broad entire. Shortest stamens about 1 cm. long; filaments stout villous some distance above the base. Disk glabrous. Gynaeceum over 2.5 cm. long; ovary short thick cylindric truncate about 4 mm. long, shorter than the style densely lepidote with white scales and setulose with many bristles those at top forming a crest encircling base of style; style thin delicate epilose more or less lepidote.

W. Yunnan. Summit of the Jangtzow Shan, Shweli-Salween divide. Lat. 25° 15′ N. Alt. 11,000–11,500 ft. Open exposed situations on cliffs. Shrub of 1 ft. Flowers pale yellow. G. Forrest. No. **18,143.** June 1919. Rare.

Another and very distinct member of the Trichocladum series distinguished readily from other species of the series by the longer calyx, the ovary clad with bristles in addition to scales and the lepidote style. The material that has come home so far has only

been in postal packet and is not adequate for full description; what I have said of the species above will require therefore some emendation when better material arrives.

L.896 **Rhododendron litiense,*** Balf. f. et Forrest.† (Souliei.)

Shrub as much as 2.5 m. high with medium thick branches usually straight. Branches of the year densely glandular with short-stalked ovoid red fleshy glands, year-old branches about 3 mm. in diameter glabrescent showing usually traces of the glands. Foliage-buds fusiform; outer scale-leaves crustaceous rounded ovate becoming oblong or oblong ovate keeled shortly apiculate, on the back densely puberulous with adpressed hairs which often redden and become greasy, margin ciliate with white often reddening branched hairs; innermost scale-leaves membranous yellow brown ligulate-spathulate about 3 cm. long 6 mm. broad at top acute more or less puberulous outside; young leaves revolute, the upper surface more or less sprinkled with stalked red glands and some floccose fasciate or rosette hairs all early deciduous, under surface clad with many cauliflower hairs and glands, petiole glandular with sessile glands underneath and stalked glands on margin and above where also are some floccose hairs. Leaves petiolate as much as 9 cm. long; lamina thinly coriaceous oblong or oblong-oval as much as 7.5 cm. long 3 cm. broad slightly narrowed at top obtuse with a short apiculus ending in a tubercular horny hydathode, margin plane thinly cartilaginous, base trunculate or shallowly cordulate; upper surface mat green shagreened, midrib shallowly

* Liti, in Yunnan, in the vicinity of which the plant was discovered.

† *Rhododendron litiense*, Balf. f. et Forrest.—Frutex ad 2.5 m. altus. Rami hornotini dense rubro-glandulosi, annotini circ. 3 mm. diam. glabrescentes. Alabastrorum perulae extimae dorso puberulae margine piloso-ciliatae, intimae ligulato-spathulatae extus puberulae. Folia petiolata ad 9 cm. longa; lamina tenuiter coriacea oblonga vel oblongo-ovalis, apice paullo angustata apiculata mucronata, margine tenuiter cartilaginea plana, basi trunculata vel subcordulata; supra opaca viridis glabra sed vestigiis glandularum juvenilium notata, costa media venisque primariis paullo elevatis erubescentibus; subtus glauca papillis epidermicis ceriferis vestita et pilis caulifloris glandulisque conspersa, costa media rubida glandularum vestigiis verruculosa; petiolus ad 1.5 cm. longus plus minusve glabrescens sed glandularum vestigia gerens. Flores in umbellam 5–6-floram brevissime racemosam dispositi, rhachi sparsim glandulosa et floccosa; bracteae intimae extus intusque sericeae; bracteolae circ. 7 mm. longae sparsim pilosae superne glandulosae; pedicelli stricti ad 1.5 cm. longi glandulosi. Calyx foliaceus flavidus circ. 7 mm. longus; cupula sparsim glandulosa; lobi 5 inaequales dorso fere eglandulosi margine glanduloso-ciliati. Corolla lutea vix 3 cm. longa campanulata carnosula extus glabra; lobi circ. 1.3 cm. longi 2 cm. lati paullo emarginati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta haud deorsum expansa glabra. Discus puberulus. Gynaeceum corolla brevius stamina subaequans; ovarium circ. 4 mm. longum conoideum truncatum glandulosum glandulis longe stipitatis; stylus glandulosus, glandulis breviter stipitatis.

grooved, primary veins about 12 on each side also shallowly grooved, the whole surface glabrous even in the midrib groove, only a trace of the juvenile glands here and there visible ; under surface glaucous with a wax bloom often purpling covered with close-set low dome-shaped wax-secreting epidermal papillae and sprinkled with short cauliflower hairs and red glands, the midrib red and raised and faintly warted with remains of glands, the primary veins red and also slightly raised ; petiole as much as 1.5 cm. long reddening grooved on upper side glabrescent but showing traces of the juvenile sessile glands on under side and stalked ones upper side. Inflorescence a terminal 5–6-flowered very shortly racemose umbel, rhachis about 7 mm. long sparingly glandular and floccose ; flowers in bud orange-red ; bracts falling as inflorescence expands, inner ones oblong spathulate rounded at top with a short mucro silky outside and inside ; bracteoles linear widening upwards and then tapered to the point about 7 mm. long .35 mm. broad shorter than pedicels sparingly hairy from base and towards top glandular, apex ending in a bristle ; pedicels strict somewhat unequal as much as 1.5 cm. long glandular with stalked red glands expanding under the calyx. Calyx foliaceous yellowish about 7 mm. long ; cup about 1 mm. long flat sparingly glandular outside, lobes elliptic or oblong unequal posterior pair largest as much as 6 mm. long 3 mm. broad almost eglandular on back regularly gland-ciliate at margin. Corolla yellow without blotch or spots barely 3 cm. long campanulate from base fleshy glabrous outside and inside, gibbous and retuse at base especially on posterior side ; lobes short and broad about 1.3 cm. long 2 cm. broad undulate and slightly emarginate. Stamens 10 unequal much shorter than corolla, longest about 1.9 cm. long with anther 3 mm. long, shortest about 1 cm. long with anther 1.5 mm. long ; filaments stout white not expanded downwards glabrous ; anthers bright brown. Disk dark green puberulous below ovary. Gynaeceum about 2 cm. long shorter than corolla about equalling longest stamens ; ovary about 4 mm. long thick conoid truncate grooved glandular with red ovoid glands on long stout ascending stalks ; style glandular throughout the glands shortly stalked, expanding into a clavate tip forming a prominent lip below the broad lobulate discoid stigma.

Yunnan. On the Li-ti-ping. Lat. 27° 12′ N. Alt. 9000–10,000 ft. Shrub of 6–9 ft. In shady forests. Flowers yellow, orange-red in bud. G. Forrest. No. **13,922.** June 1917.

A plant of the Souliei series and of the alliance of *Rh. Wardii*, W. W. Sm. and *Rh. croceum*, Balf. f. et W. W. Sm., distinguished from both of them by the white-grey of the purpling under-surface of the leaves. It has not the glands on the outside of the

corolla of *Rh. croceum* nor the nearly sessile and sessile glands of the ovary of *Rh. Wardii*.

The plant in unripe fruit gathered by Forrest in 1914 on the Kari Pass and referred to *Rh. croceum* * may perhaps be this species.

4897 **Rhododendron Macabeanum,**† Watt MS.‡ (Grande.)

Tree as much as 15 m. high with short stem and brown bark and bearing twisted more or less whorled ascending branches forming a crowded dome. Branches thick when a year old about 7.5 mm. in diameter densely tomentose with a chestnut-brown indumentum, eglandular. Foliage-buds large oblong with imbricate scales as is typical of the Grande series ; scale-leaves eglandular the outermost ovate acuminate-caudate more or less tomentose; intermediate rounded emarginate without tomentum; innermost chestnut-brown or reddish. Leaves large petiolate as much as 30 cm. long in rosettes of 4–5 at end of branches ; lamina thickly leathery oblong-elliptic or somewhat rounded as much as 27 cm. long 18 cm. broad, apex rounded emarginate with a stiff mucro, margin cartilaginous somewhat flat, towards the base narrowed somewhat truncately obtuse ; upper surface dark green shagreened with a grooved midrib and about 14 impressed primary veins on each side, glabrous or sprinkled with vestiges of juvenile tomentum ; under surface at first white or greyish-white somewhat glossy clad with a compact smooth

* Notes R.B.G. Edin., x (1917), 95.

† See p. 129 for explanation.

‡ *Rhododendron Macabeanum,* Watt MS.—Arbor ad 15 m. alta trunco brevi corticeque brunneo. Ramuli crassi annotini circ. 7.5 mm. diam. dense spadiceo-tomentosi eglandulosi. Alabastra magna oblonga eglandulosa. Folia magna petiolata ad 30 cm. longa ; lamina crasse coriacea oblongo-elliptica vel subrotundata ad 27 cm. longa 18 cm. lata, apice rotundata emarginata rigide mucronata, margine cartilaginea subplana, basim versus attenuata truncatim obtusa ; supra atroviridis haud rugulosa glabra vel vestigiis tomenti juvenilis conspersa, costa media sulcata, venis primariis utrinsecus circ. 14 impressis ; subtus primo albida indumenti strato uniformi compacto laevi subnitente vestita, postea opaca saepe sordida plus minusve lanato-tomentosa, costa media venisque primariis elevatis ; petiolus crassus circ. 2.5 cm. longus plus minusve tomentosus. Flores plurimi in umbellam compactam magnam 10 cm. diam. aggregati; bracteae late ovatae vel rotundatae, steriles coriaceae emarginatae extus glabrae, fertiles abrupte acuminatae rubrae extus intusque sericeae ; pedicelli validi breves circ. 1.5 cm. longi albido-tomentosi eglandulosi sub calyce oblique expansi. Calyx vix evolutus lobis irregularibus minutissimis tomentosis. Corolla laete flava vel flavido-alba a basi angusta late tubuloso-campanulata circ. 5 cm. longa ; tubus intus varo magno striisque purpureis basim versus notatus circ. 3.5 cm. longus basi gibbosus ; lobi 8 rotundati circ. 2 cm. lati emarginati undulati. Stamina 16 inclusa ; filamenta glabra ; antherae brunneae. Gynaeceum corolla brevius ; ovarium pilis albidis fasciatis compactis tomentosum ; stylus glaber tenuis ; stigma coccineum magnum discoideum undulatum. Capsula leviter curvata ad 4 cm. longa 1.5 cm. lata plus minusve tomentosa.

uniform layer of indumentum of long stalked hairs with many intertwining thread-like branches later opaque often becoming blackish and more or less woolly tomentose on the surface through the spreading of the tree-like branches of the indumentum hairs, midrib and primary veins prominent ; petiole thick about 2.5 cm. long more or less tomentose. Flowers very many in a compact umbel 10 cm. in diameter ; bracts broadly ovate or rounded, outermost leathery emarginate glabrous outside, inner ones abruptly acuminate reddened silky outside and inside ; pedicels stout short about 1.5 cm. long whitely tomentose eglandular very obliquely expanded below the calyx. Calyx almost obsolete with irregular lobulation tomentose. Corolla pale yellow or yellowish white tubular-campanulate from a narrow base about 5 cm. long ; tube with large purple spots at base and purple striae about 3 cm. long pouched at base ; lobes 8 short imbricate rounded about 2 cm. broad emarginate undulate. Stamens 16 shorter than corolla ; filaments glabrous ; anthers brown. Gynaeceum shorter than corolla ; ovary tomentose with white compact fasciate hairs ; style glabrous slender ; stigma large scarlet undulate. Capsule slightly curved about 4 cm. long 1.5 cm. in diameter more or less tomentose, dehiscing by four compound separating valves each bearing 4 chambers.

Manipur. Japvo, Naga Hills. Alt. 8000–9500 ft. A large tree covered with leaves only on the extremities of the ultimate branches. Leaves a foot or more long broad obtuse apiculate densely woolly below and white or with age becoming black. Leaf-buds oblong with broad oval emarginate scales. Flower-buds round as large as the fist with the inner bracts suddenly apiculate or acuminate. Flowers large pale yellow not spotted. Peduncle half inch long white hairy. Calyx a ring angled but having white hairs. Corolla crumpled with 8 short broad undulate petals the bottom of tube with deep brown streaks. Stamens 16 opening in the deep brown anthers by large terminal pores from which the pollen exudes in long strings sticking together. Style terminal. Stigma large flat undulated scarlet. Ovary covered with white wool. Named in honour of Mr. M'Cabe, the Deputy Commissioner who organised this excursion as many others through his district. Watt. No. **6212.** March 9, 1882.

Manipur. Ching Sow. Alt. 8500 ft. Branched distorted tree. Bark brown. Stem with annular swellings a foot apart. Flowers yellow forming large heads. Fruit bursting into 4 patches with gill-like plates. Leaves large woolly below in whorls of 4 to 5 on ultimates of branches. Watt. No. **6511.** April 16, 1882.

Manipur. Japvo summit. Alt. 9800 ft. Rhododendron

found with fruit below, but a few in flower at summit ; former collected. Large balls of flowers yellow white. Young leaves erect white woolly below with large red bracts and scales forming a curious feature of vegetation at this season. Watt. No. **6892.** May 18, 1882.

Manipur. Japvo, Naga Hills. Alt. 8000–9500 ft. Re-gathered by my friend Dr. Conry, who reports that it was quite out of flower in July, also *Rh. Elliottii*—just three specimens in flower. Leaves densely and softly tomentose or lanate. This seems to me a remarkable form the leaves being much more elliptic than in the Sikkim plant. Named in honour of the Deputy Commissioner, Naga Hills, who accompanied me on my first trip to the Naga Hills. Watt. No. **7334.** July 22, 1882. [Mr. M'Cabe was subsequently killed in the great earthquake.—G. W., 1915.]

In Sir George Watt's Herbarium are four sheets of specimens of this Rhododendron collected by him in Manipur, and which he regarded as a variety of *Rh. Falconeri*, Hook. f. and named var. *Macabeanum*. It differs from *Rh. Falconeri*, Hook. f. in a degree too great to allow of our looking upon it as a form of that species. Prominent differences are :—The leaves want the cordate base, the indumentum is composed of branching stalked hairs not of cyathiform scales, the pedicels and ovary are tomentose and altogether deficient in glands. The plant is much more closely related to *Rh. grande*, Wight (the relationship was recognised by Sir George Watt : see his interesting and prescient comments quoted on pp. 131–32), but is not identical with that species, differing in the broader leaves, in their ultimately lanate indumentum, in the eglandular tomentose short pedicels and ovary. As a distinct species of the Grande series of Rhododendrons *Rh. Macabeanum*, Watt is of special interest as a connecting link between the Sikkim and Bhutan *Rh. grande*, Hook. f. and the Eastern Burmese and Yunnan *Rh. sinogrande*, Balf. f. et W. W. Sm. To *Rh. sinogrande*, Balf. f. et W. W. Sm. its resemblance is greater than to *Rh. grande*, Wight, but the smaller leaves, the longer hairs of the indumentum ultimately making the under surface of the leaves woolly, and the shortly stalked flowers making a compact umbel are easily observed diagnostic marks.

Sir George tells me that in the early eighties of last century he sent home in manuscript descriptions of this and other species along with his Manipur collections which were made use of to some extent by Mr. C. B. Clarke for his paper "On the Plants of Kohima and Manipur," published in the Journal of the Linnean Society, xxv (1890). The novelties of Dr. Watt's collecting which had not been collected also by Mr. Clarke were not

included in the Linnean paper, and therefore some interesting Manipur forms of Rhododendron have been unnoticed up till now of which this is one. Sir George Watt has sent to me his MS. of 1883 dealing with *Rh. Macabeanum*, Watt, and I give its story here for an account of the species written shortly after observation of it in its native habitat :—

"*Rhododendron Falconeri*, Hook. fil., var. *Macabeanum*, nov.; leaves elliptic not cordate nor obtuse but tapering, under surface densely coated with long white soft felt ; flowers nearly twice as large as in the type form of *Falconeri*, beautiful bright yellow (instead of creamy white) with large purple spots at the base and ascending streaks ; stigma large bright scarlet (not green) and undulated.

" Japvo and the Barrail Range in the Naga Hills, and Ching Sow and the higher Burmah-Manipur hills. Alt. 8000–9000 feet, forming dense brushwoods often covering entirely the summits of hills (*i.e.* summit of Japvo, etc.), rarely scattered through other forests as in Sikkim but often associated with bushy Rhododendrons.

" A tree 40 to 50 feet in height with short stem soon branching into more or less whorled ascending branches forming a crowded dome. Stem and branches having every foot or so isolated annular swellings with a central groove as if they had been formerly compressed and distorted by a climber. Leaves large spreading in whorls of 4 to 5 not rough and granularly ferruginous felted below (as in *Falconeri*) but matted with delicate soft white wool changing into a beautiful fulvous and ultimately with age becoming quite black. Seedlings glabrous and brown-coloured below, the felt commencing upon the veins of the 3rd and 4th leaves and gradually spreading over the entire surface.* Leaf-buds large erect ½ foot long embraced by long bright brown or red scales elongating and producing their leaves in May immediately after the flowers have fallen. Flowers 2 inch long and 1½ broad quite tubular with 8 short imbricating broad undulate or crumpled and emarginate lobes. Bracts broad ovate acuminate much shorter and more caducous than in *Falconeri*. Stamens 16, anthers brown opening by terminal pores and discharging masses of white pollen grains. Stigma large undulated, scarlet. Ovary coated with white hairs as are also the pedicels. Fruit 16-valved bursting into 4 plates lined by the gill-like valves.

* Sir George Watt here notes a feature in the life of Rhododendrons which has been generally overlooked by observers, namely, the late appearance of indumentum upon the young plants, and its gradual spread over the surface in successive leaves until the adult form shows the complete covering from the first. (See Bot. Soc. Trans. Edin., xxvii (1917), 222.)

"I have been at a loss to know whether this remarkably handsome tree should be regarded as distinct from *Falconeri* or not. Having gathered the latter plant only a few months ago in Sikkim I had no doubt in my mind whatever when I came across *Macabeanum* on Japvo that it was quite distinct. The dried specimens, however, approach each other so very much that I have considered it advisable for the present to regard it as but a variety of Hooker's Sikkim plant which he named in honour of the late Dr. Falconer.

"The discovery of *Falconeri* or a nearly allied form so far away from Sikkim must be viewed as a most interesting addition to our knowledge of the Himalayan vegetation. An addition which renews the ever-deepening feeling of disappointment at the want of interest taken in Botanical Science in India. Whether this curious tree of which Sir Joseph Hooker remarks, 'It is the most striking and distinct of the genus,' has been spread from East Nepal and from the neighbourhood of Tonglo in West Sikkim eastward through the vast and practically unexplored Bhotan Himalayas, to the Naga Hills, must remain a problem for the future to solve. We know now, however, that a most interesting plant discovered in 1849, and which down to the present date has been considered as confined to an extremely limited area on the Singaleelah Range (in Sikkim and Nepal), has its home in the Naga Hills and the lofty Burmah-Manipur mountains forming alpine forests on numerous peaks within an area of over 3000 square miles.

"Griffith during his exploration of a portion of Bhotan brought to light a large number of extremely interesting plants which have practically been lost to Science. Most of these have never since been rediscovered, of which *R. grande* is of interest as being probably a form of *Falconeri*, which may prove the link of connection with *Macabeanum* and help to explain the remarkable distribution of *Falconeri*. Like *grande* the new species which I have named *Kingianum* is also nearly allied to *Falconeri*, connecting these with *argenteum* and *Hodgsoni*, and we may thus fairly expect to find that not only are the Naga Hills and the Northern Burmah-Manipur mountains the true home of *Falconeri*, but of the series to which we shall have to add other names besides *grande* and *Macabeanum* and *Kingianum*."

Rhododendron Mackenzianum,* G. Forrest.† (Stamineum.)

Shrub or tree as much as 12 m. high with red bole about 4 dm. in diameter and flaking bark ultimate branchlets straight

* To my friend Miss M'Kenzie of Rangoon.—G. FORREST.

† *Rhododendron Mackenzianum*, G. Forrest.—Frutex vel arbor ad 12 m. altus ramis virgatis annotinis griseis glabris circ. 2 mm. diam. vetustioribus

one or two at each branching annual growths 1 dm. more or less in length about 2 mm. in diameter when a year old glabrous, with white-grey bark not thickening much for some years distinctly nodulose at end of each year's growth. Foliage-buds elongated narrowly ovoid pointed with many scale-leaves, the outer short ovate imbricate each slightly puberulous on back and with a slightly denticulate margin the denticules sometimes glandular-mucronulate and densely white puberulous around the mucro, intermediate scale-leaves elongated oblong acute, innermost scale-leaves dark brown submembranous narrowly elongated lanceolate acuminate as much as 3 cm. long 6 mm. broad slightly puberulous outside the margin ciliate at base then towards apex denticulate and at tip densely clad with interwoven hairs often nearly glabrous ; young leaves revolute most glabrous. Leaves petiolate as much as 15 cm. long in a cluster of 5–7 at the end of the naked annual growth ; lamina of parchment consistence lanceolate acuminate as much as 13 cm. long 4 cm. broad, terminated by an apiculate mucro, margin white finely cartilaginous, base cuneate ; upper surface bright green glossy most glabrous midrib grooved slightly pink-tinted, primary veins many pinnately disposed as many as 16 on each side ; under surface paler green mat most glabrous the pink-tinted midrib prominent the primary veins very slightly raised ; petiole about 1 cm. long grooved pink-tinted most glabrous. Flowers strongly fragrant arranged in a fascicle of 1–flowered inflorescences at end of shoot surrounding a terminal vegetative bud, each partial inflorescence axillary the pedicel of its flower enclosed during flowering by the persistent scale-leaves of the flower-bud and by its persistent prophylls ; flower-bud slightly sticky elongated pointed like the vegetative bud ; outermost sterile bracts somewhat crustaceous ovate or ovate-rounded

nodulosis. Alabastra elongata acuta pluri-perulata subglutinosa. Folia petiolata ad 15 cm. longa ad apicem ramulorum 5–7-aggregata ; lamina pergamentacea lanceolata acuminata ad 13 cm. longa 4 cm. lata mucronata, margine albo-cartilaginea, basi cuneata ; supra laetevirens nitens glaberrima costa media sulcata ; subtus pallidior opaca glaberrima costa media pallide rosea elevata ; petiolus circ. 1 cm. longus glaberrimus roseo-tinctus. Flores fragrantissimi in axillis foliorum ad apicem ramulorum alabastrum vegetativum gerentium fasciculati ; quaeque inflorescentia lateralis uniflora bracteis plurimis sub anthesi persistentibus cincta ; bracteae extimae perulis similes striatae puberulae, intimae submembranaceae obovato-spathulatae ultra 2 cm. longae acutae cucullatae margine denticulato-glandulosae ; pedicelli virides glaberrimi circ. 2.5 cm. longi. Calyx carnosulus minutus glaber. Corolla carnosula lilacineo-rosea postice viridivarosa infundibuliformis ad 6.5 cm. longa extus intusque glabra ; tubi pars inferior angusta 3 cm. longa supra in limbum concavum ampliata ; lobi 5 rotundati ad 3 cm. longi. Stamina 10 inaequalia ; filamenta basim versus minute puberula. Discus viridis glaber. Gynaeceum corollam subaequans ; ovarium tenue cylindricum sursum paullo attenuatum truncatum glabrum circ. 1 cm. longum ; stylus glaber ; stigma discoideum latum lobulatum.

grey-brown longitudinally striate obtuse or acute densely puberulous outside, intermediate elongated oblong or oval, innermost membranous obovate-spathulate acute over 2 cm. long broader above about 7 mm. across and there cucullate puberulous outside, margin denticulate and glandular and with white hair-cilia at top ; bracteoles persistent as long as the innermost bracts membranous narrowly lanceolate above on a strap-shaped stalk half as long as whole bracteole, glandular denticulate in upper half and shortly hair-crested ; pedicels stout thick about 2.5 cm. long most glabrous dark green not dilated below the calyx. Calyx fleshy dark-coloured glabrous not 1 cm. long with an undulate lip. Corolla fleshy lilac-pink with green blotch posteriorly as much as 6.5 cm. long with a long funnel-shaped tube half the length of the corolla expanding into a concave more open hardly spreading 5-lobed limb, glabrous both outside and inside ; lobes of the limb broad rounded as much as 3 cm. long 2.5 cm. broad. Stamens 10 unequal aggregated around the style slightly longer than the narrow portion of corolla-tube ; filaments shortly puberulous towards the base. Disk dark green glabrous. Gynaeceum about as long as the corolla ; ovary thin dark green about 1 cm. long cylindric but narrowed to the truncate top glabrous ; style long glabrous tip upward turned ending in a broad discoid lobulate stigma.

W. Yunnan. Shweli-Salween divide. Lat. 25° N. Alt. 10,000 ft. In dense mixed and pine forest. Shrub of 12–20 ft. Flowers fleshy, white, flushed rose slightly exterior, interior lower base green ; strongly fragrant. G. Forrest. No. **16,111.** April 1918.

W. Yunnan. Shweli-Salween divide. Lat. 25° N. Alt. 9000 ft. In thickets and mixed forests. Shrub of 8–16 ft. Flowers fragrant, soft purplish-rose, deepest in bud, with tints of carmine in it and with a greenish-yellow blotch on under side interior towards base. G. Forrest. No. **17,819.**

W. Yunnan. Western flank of the N'Maikha-Salween divide. Lat. 26° N. Alt. 9000–10,000 ft. In open thickets. Flowers rose, tube very deep purple blotched yellowish-green, fragrant. G. Forrest. No. **17,832.**

N.E. Burma. Hpyepatt Pass. Langyang Pass. Hpimaw. Alt. 7500 ft. Open places of the forest. Forms a fine tree with a bare bold bole like a Scots pine but red with flaking bark. Can attain 40 ft. with diameter of 15 inches. Very floriferous in solid rounded masses of blossoms in full beauty at Hpimaw by April 6. Flowers ,very pale lilac pink with deeper centre and brownish tinge in throat of upper segment, and intensely fragrant. Purpled exterior of tube showing through. R. Farrer. No. **801.** April 6, 1919.

Rh. Mackenzianum belongs to a group of Rhododendrons characterised by straight yearly growths often of some length, the very glabrous leaves produced in a rosette at the end of each yearly growth persisting for two or more years and thus false whorls of leaves clothe the branches; flowers produced in lateral trusses fascicled at the end of the shoots around a terminal vegetative bud; corolla with a narrow funnel-shaped base and a 5-lobed limb, the lobes usually half the length of the whole corolla; stamens with thin filaments; ovary long narrow ending in a long usually exserted style. Several species have been described which show more or less the characters named. They are :—

Rh. Cavaleriei, Lévl.	Kweichow : Pinfa.
Rh. Chaffanjonii, Lévl.	Kweichow : Kouy Yang.
Rh. Esquirolii, Lévl.	Kweichow : Gan Chouen.
Rh. Feddei, Lévl.	Kweichow : Pinfa.
Rh. Hancockii, Hemsl.	S. Yunnan : Mengtsz.
Rh. Henryi, Hance.	Kwantung : North River.
Rh. Latoucheae, Franch.	Fokien : Kuatun.
Rh. Mackenzianum, G. Forrest.	W. Yunnan, N.E. Upper Burma.
Rh. moulmeinense, Hook.	Lower Burma : Moulmein.
Rh. nematocalyx, Balf. f. et W. W. Sm.	W. Yunnan : Hills N. of Tengyueh.
Rh. oxyphyllum, Franch.	S. Yunnan : between Muongle and Keu-ma-tsi.
Rh. pittosporaefolium, Hemsl.	W. Hupeh : Patung district.
Rh. siamense, Diels.	Siam : Doi Sutep.
Rh. stamineum, Franch.	N.E. Yunnan : Tcheng-fong-chan.
Rh. stenaulum, Balf. f. et W. W. Sm.	W. Yunnan : Divide between Pupiao and Yung Chang valleys.
Rh. Tutcherae, Hemsl. et Wils.	S. Yunnan : Mengtsz.
Rh. Westlandii, Hemsl.	Kwantung : Lantao Island.
Rh. Wilsonae, Hemsl. et Wils.	Hupeh.

There will be several new species to add to this list when the material collected by Forrest and others has been fully worked up. I hope to be able soon to publish an account of the group, when the limitations and relationships of the species will be discussed.

No one of the members of this group is likely to be a hardy species. It is essentially one of Central and South China, of N.E. Upper Burma, and of S. Burma. *Rh. Mackenzianum* is one of the most beautiful and is allied to *Rh. stenaulum*, but distinguishable by its bright green very glossy foliage, the narrower leaves with long acuminate points, the shorter pedicels and larger flowers. In the Gardeners' Chronicle, Ser. 3, lxv. (1919), 302, Mr. Farrer describes and figures the plant under his field number 801.

4899 **Rhododendron Meddianum,*** G. Forrest.† (Thomsoni.)

Shrub barely 2 m. high with stout branches. Branches of the year stiff purple with glaucous bloom glabrous about 3 mm. in diameter, year-old branches about 6 mm. in diameter brown becoming ash-grey before decortication. Foliage-bud ovoid pointed not nested; outermost bud-scales half-foliage the base rounded reddened the upper half or less green like foliage; intermediate rounded from acuminate to acute and mucronate slightly keeled glabrous outside finely white-ciliate; innermost scales within the bud not sticky, at expansion carried up on the elongating shoot, petiolate; young leaves in bud revolute. Leaves petiolate as much as 12 cm. long; lamina thickly leathery oval or oblong-oval or oblong sometimes a little broader above the middle as much as 10 cm. long 4.5 cm. broad apex rounded somewhat trunculate or retuse with a thick tuberculate mucro, margin cartilaginous, base obtuse or rounded not cordulate; upper surface ash-grey with a thin pellicle of wax removable by a solvent (such as benzole) when there is exposed a green foveolate surface, midrib slightly pink and shallowly grooved, primary veins some 10–12 on each side slightly prominent; under surface bronzed green glabrous, midrib and primary veins pink and raised, older leaves showing a raised ultimate reticulum of venation (perhaps result of drying); petiole broad as much as 2 cm. long glaucous and purple glabrous grooved above. Inflorescence a 5–7-flowered terminal umbel; innermost bracts red-brown membranous broadly spathulate as much as 3.5 cm. long 1 cm. broad whitely ciliate; bracteoles filiform as long as the pedicels glabrous but for a long white hair-crest; pedicels about 1 cm. long stout glabrous reddish expanding into the

* In compliment to George Medd, Esq., Agent I.F. Company, Bhamo, Upper Burma, to whom I am indebted for much assistance.—G. FORREST.

† *Rhododendron Meddianum*, G. Forrest.—Frutex vix 2 m. altus. Rami hornotini glauco-purpurei eglandulosi, annotini circ. 6 mm. diam. epunctulati. Alabastra roseo-tincta perulis ciliatis. Folia petiolata ad 12 cm. longa; lamina ovalis vel oblongo-ovalis vel oblonga ad 10 cm. longa 4.5 cm. lata apice rotundata mucronata, margine cartilaginea, basi obtusa vel rotundata; supra grisea cerae pellicula vestita; subtus aeneo-viridis glaberrima costa media venisque primariis erubescentibus; petiolus ad 2 cm. longus ruber glaberrimus. Flores in umbellam 5–7-floram dispositi; bracteae intimae submembranaceae late spathulatae ciliatae; bracteolae filiformes pedicellos aequantes pilo-cristatae; pedicelli circ. 1 cm. longi validi glauco-purpurei glaberrimi. Calyx ad 6 mm. longus cupularis ultra medium 5-partitus extus glaber; lobi rotundati glabri sub fructu aucti. Corolla tubuloso-campanulata postice maculata variculataque carnosula 5-loba; lobi rotundati lati emarginati 1.5 cm. longi 2.5 cm. lati. Stamina 10 inaequalia corolla breviora; filamenta glabra. Discus glaber. Gynaeceum corolla paullo brevius; ovarium conoideum truncatum sulcatum glaberrimum; stylus glaber. Capsula cylindrica circ. 2 cm. longa 7 mm. diam. glaberrima. Semina pallida complanata elongata circ. 3 mm. longa.

dark cup of the calyx. Calyx conspicuous crimson cup-shaped about 6 mm. long glabrous fleshy 5-lobed ; lobes about twice length of cup subequal rounded as much as 7 mm. broad entire or slightly denticulate glabrous. Corolla tubular-campanulate about 6 cm. long fleshy deep crimson with many dark oblong spots on posterior three petals and a darker almost median blotch on middle one glabrous inside and outside ; tube at the base 5-pouched retuse, pouches dark crimson inside separated by 5 imperfect interpetaline folds, expanding above into a broad 5-lobed limb ; lobes rounded emarginate crenulate about 1.5 cm. long 2.5 cm. broad. Stamens 10 unequal shorter than corolla, longest about 4 cm. long reaching to base of corolla-lobes with dark anther about 3 mm. long, shortest about 2 cm. long with anther about 2 mm. ; filaments pale yellow (?) widened to base glabrous. Disk glabrous. Gynaeceum about equal to or a little shorter than corolla longer than stamens ; ovary about 5 mm. long conoid truncate grooved glabrous ; style glabrous slightly expanded at apex below the narrow lobulate stigma. Capsule cylindric slightly curved about 2 cm. long, 7 mm. in diameter glabrous slightly glaucous more or less encircled by the reddened enlarged somewhat hardened persistent calyx dehiscing from apex by 5 valves. Seeds pale brown flattened striate oblong about 3 mm. long winged and with a crest at each end.

W. Yunnan. Shweli-Salween divide. Lat. 25° 20′ N. Alt. 10,000–11,000 ft. Open rhododendron scrub. Shrub of 4–6 ft. Flowers deep crimson fleshy. G. Forrest. No. **15,767.** June 1917.

Yunnan. Without precise locality. Duplicate in fruit. G. Forrest. No. **16,037.** Nov. 1917.

W. Yunnan. Shweli-Salween divide. Lat. 25° 30′ N. Alt. 10,000–11,000 ft. Duplicate of 1917. G. Forrest. No. **17,703.** June 1918.

W. Yunnan. Without precise locality. Duplicate in fruit. G. Forrest. No. **17,729.** Oct. 1918.

A splendid plant of the Thomsoni series. Forrest obtained abundance of seed and the plant will be therefore soon in cultivation. Under *Rh. eclecteum*, Balf. f. et Forrest (see p. 108), which is the nearest ally of our species, I have pointed out that *Rh. Meddianum* may be regarded as a southern representative of the phylum which appears in the north as *Rh. eclecteum*. First observation is apt to lead to the opinion that the two species are more alike than they really are, and this because in both the upper surface of the somewhat similarly shaped foliage-leaves is clad with a grey pellicle of wax and this catches the eye at once. The differences

between them are, however, many and the more prominent are tabulated here :—

Rh. Meddianum.	*Rh. eclecteum.*
Young stems eglandular.	Young stems glandular.
Foliage-buds not nest-buds not sticky inside, perulae ciliate.	Foliage-buds nest-buds very sticky inside, perulae eciliate.
Foliage-leaves more oval and oblong not markedly obovate, obtuse or rounded at base.	Foliage-leaves obovate (pear outline) occasionally oblong, cordulate at base.
Inflorescence a 5–7-flowered umbel.	Inflorescence a 12- or more-flowered racemose umbel.
Pedicels about 1 cm. long.	Pedicels 2 cm. long.
Ovary glabrous.	Ovary glandular.

Of the first series of specimens collected by Forrest of this plant all save a few, reserved as duplicate forms from the sending to Europe, were lost in a steamer which was torpedoed on the way home.

4900 **Rhododendron megaphyllum,** Balf. f. et Forrest.* (Falconeri.)

Robust shrub as much as 9 m. high with stout branches. Branches a year old 1 cm. or more in diameter surface brown tomentose, the tomentum persisting more or less for several years. Foliage-buds unknown. Leaves petiolate as much as 20 cm. long ; lamina obovate sometimes approaching elliptic but always wider above the middle often fiddle-shaped narrower or broader as much as 18 cm. long 12 cm. broad, apex often recurved rounded sometimes subtruncate slightly emarginate the sinus occupied by a rounded red tuberculate mucro, margin broadly cartilaginous entire not recurved or slightly so, base wedge-shaped or obtuse or rounded sometimes showing an abrupt narrowing towards the base prolonged as a narrow wing

* *Rhododendron megaphyllum*, Balf. f. et Forrest.—Frutex robustus ad 9 m. altus. Rami crassi annotini tomentosi demum glabrescentes. Folia petiolata ad 20 cm. longa ; lamina crasse coriacea plus minusve obovata ad 18 cm. longa 12 cm. lata, apice rotundata emarginata, margine cartilaginea, basi cuneata vel rotundata ; supra atroviridis rugulosa indumenti juvenilis vestigiis sordidis conspersa ; subtus rufo-tomentosa indumento bistrato discolore induta, strati superi pilis poculiformibus haud fimbriatis deciduis vel persistentibus, inferi pilis rosulatis pelliculam albidam aedificantibus ; petiolus ad 2.5 cm. longus haud sulcatus. Flores in racemo-umbellam circ. 20-floram dispositi rhachi tomentosa ; bracteae exteriores rotundatae viscidae, intimae fertiles oblongo-obovatae vel spathulatae sericeae ; bracteolae breves circ. 5 mm. longae ; pedicelli tomentosi ad 4 cm. longi sub fructu elongati. Calyx minutus 8-dentatus. Corolla flava basi rubro-variculosa oblique campanulata 8-loba. Stamina 16 corolla gynaeceoque breviora ; filamenta glabra. Discus glaber. Gynaeceum corolla brevius ; ovarium ovoideum 10–11-loculare pilis fasciatis dense tomentosum ; stylus sub stigmate discoideo late clavatus. Capsula curvata pilis spadiceis plus minusve vestita. Semina complanata arillata.

along the petiole ; upper surface dark green mat somewhat rugulose and shagreened, midrib raised at base slightly grooved upwards, primary veins 12 or a few more on each side slightly grooved spreading from midrib at an obtuse angle often approaching a right angle curving slightly upwards, surface especially midrib and veins showing greyish vestiges of a juvenile cobwebbed indumentum ; under surface cinnamon-brown the midrib raised black-purple, the primary veins also raised, the whole surface clad with a bistrate indumentum, the upper stratum of cup-shaped stalked brown hairs with a bell-shaped base to the cup, the stalk stout many-celled, the cup-walls of isodiametric cells, the margin prolonged into a few acuminate lobes not fringed, midrib usually devoid of these cup-hairs, the whole stratum persistent or more or less deciduous, the under stratum of rosette white hairs with short stalks and vesicular branches agglutinating into a crustaceous skin under the upper stratum and becoming exposed as a grey-white surface if the upper stratum falls ; petiole as much as 2.5 cm. long cylindric not grooved coated with indumentum like the stem the under white stratum persisting more or less, slightly winged by the decurrent lamina. Inflorescence a racemose umbel with brown tomentose rhachis about 3 cm. long, flowers as many as 20 in the truss, flower-bud globose ; bracts outer sterile ones nearly rotundate thick often thinner at margin leathery imbricate, inner fertile bracts oblong or oblong-spathulate or obovate-spathulate rounded towards top and apiculate outside densely coarsely silky, inside finely silky towards the top ; bracteoles linear very short about 5 mm. long densely pilose outside and hair-crested ; pedicels somewhat unequal as much as 4 cm. long elongating in fruit densely clothed with a pinkish woolly indumentum of much branched long interlocking hairs, swollen at top below the calyx and there oblique. Calyx very small densely clad like the pedicel showing 8 very short triangular teeth. Corolla yellow with crimson or rose base obliquely campanulate the posterior side convex slightly longer as much as 4.5 cm. long set on obliquely nearly at right angles to axis of pedicel ; tube very slightly pouched at base glabrous inside and outside ; limb 8-lobed ; lobes imbricate short and broad about 8 mm. long 1.4 cm. broad emarginate. Stamens 16 unequal, shorter than corolla and gynaeceum, longest about 2.5 cm. long, shortest about 1.8 cm. long ; filaments slightly widened at base glabrous ; anthers elliptic about 3.5 mm. long. Disk glabrous. Gynaeceum about 3 cm. long a little shorter than corolla on its anterior side ; ovary ovoid truncate about 8 cm. long grooved 10–11-locular eglandular enwrapped in a pinkish thick soft woolly tomentum of compactly arranged fasciate hairs, the stalks of the hairs long many-celled, the

branches thick-walled unicellular pointed ; style glabrous much dilated below the lobulate broad discoid stigma. Capsule cylindric slightly sickle-shaped about 2 cm. long 1 cm. in diameter more or less clad with bright brown fasciate hairs, dehiscing by valves of 1 or more carpels. Seeds flat dark brown oblong as much as 3 mm. long 1 mm. across with a lateral wing-aril, a large chalazal membranous crest, the funicular end only slightly produced often pointed.

W. Yunnan. Shweli-Salween divide. Lat. 25° 30′ N. Alt. 11,000 ft. In rhododendron forest. Shrub of 10–20 ft. Flowers yellow with a faint flush of rose at base. G. Forrest. No. **17,650.** June 1918.

W. Yunnan. Shweli-Salween divide. Lat. 25° 20′ N. Alt. 11,000 ft. In rhododendron forest. Shrub of 30 ft. Flowers yellow tinged crimson at base. G. Forrest. No. **17,678.** June 1918.

W. Yunnan. Shweli-Salween divide. Alt. 11,000 ft. Duplicate of 1912–17. G. Forrest. No. **17,691.** May 1918.

Yunnan. Duplicate in fruit. G. Forrest. No. **16,036.** Nov. 1917.

Yunnan. Duplicate in fruit. G. Forrest. No. **17,769.** Oct. 1918.

A species of the Falconeri series nearly allied to *Rh. basilicum*, Balf. f. et W. W. Sm., from which its smaller leaves campanulate slightly fringed not funnel-shaped fringed cup-hairs of the indumentum of the under-leaf surface and the 10–11-locular not 13–15-locular ovary distinguish it. Capsule only about 2 cm. long not 4 cm.

Like *Rh. basilicum* it has a persistent cinnamon-coloured indumentum, the surface of which is somewhat spongy, showing the mouths of the funnel-shaped cup-hairs embedded in the few short marginal branches of the cup. The cup-hairs readily separate not being held together by an interlacing of branch hairs.

Rhododendron megeratum,* Balf. f. et Forrest.† (Boothii.)

Shrub about half a metre high with straight at first red then chestnut-brown coloured branches of short annual growths

* *μεγήρατος*, passing lovely.

† *Rhododendron megeratum*, Balf. f. et Forrest.—Frutex nanus ad .5 m. altus. Rami stricti laete brunnei tenues annotini circ. 1.5 mm. diam. dense setulosi elepidoti, perulis persistentibus plus minusve vestiti. Folia petiolata ad 4 cm. longa ; lamina coriacea ovalis ad 3.3 cm. longa vix 2 cm. lata, obtusa mucrone decurvo, margine cartilaginea plus minusve setulosa recurva, basi rotundata vel subtrunculata ; supra laete viridis glabra subnitens ; subtus griseo-alba papillis ceriferis baculiformibus vestita et squamulis aurantiacis scintillantibus inaequalibus in foveis depressis discontigue lepidota ; petiolus rubescens circ. 7 mm.

about 3 cm. long occasionally showing longer virgate shoots. Branches of the year densely bristly elepidote yet with here and there a scale, about 1.5 mm. in diameter girt at the base by persistent outer brown scale-leaves, older twigs becoming blackish grey and decorticating in third or fourth year, the outer foliage-bud-scales persisting and marking base of successive annual growths for two or three years. Foliage-buds small ovoid ; outer-most scale-leaves broadly ovate or rounded-oval crustaceous sparingly lepidote outside keeled mucronulate, margin densely whitely ciliate at top ; intermediate scale-leaves more oblong ; innermost scale-leaves membranous carried up on elongating shoots oblong-oval pointed about 1.5 cm. long 6 mm. broad sparingly lepidote and sticky outside more or less setulose, young leaves conduplicate-convolute. Leaves petiolate as much as 4 cm. long persistent for two or more years ; lamina leathery oval or oblong-oval as much as 3.3 cm. long under 2 cm. broad obtuse with a short deflexed tuberculate greenish-yellow mucro, margin thickly cartilaginous recurved usually bristly or crenulate from scars of fallen bristles, base rounded or somewhat truncate ; upper surface bright green somewhat glossy obscurely coarsely shagreened, midrib grooved glabrous except at very base where puberulous and with a few bristles, primary veins some 6–7 on each side hidden ; under surface bright grey-white with raised whitish yellow sparingly lepidote midrib, the primary veins concealed, all over clad with long rod-like epidermal wax-forming papillae and lepidote with brownish or orange-coloured unequal discontiguous peltate scales sunk in the leaf-pits and overlapped more or less by the wax-forming papillae, the scales with swollen convex glistening disk distance between the scales greater than their diameter, about 6–7 scales in a sq. mm. ; petiole reddish brown about 7 mm. long bristly all over and especially below, grooved and puberulous in groove, lepidote amongst the bristles below. Flowers solitary terminal ; flower-bud ovoid the last leaf of the year's shoot adpressed to the bud and becoming leaf-scale-like ; outer bracts rounded and with an acute tip keeled reddened above sometimes lepidote on back when exposed with

longus lepidotus setulosus. Flores solitarii terminales ; bracteolae lineares circ. 1.3 cm. longae pedicello longiores ; pedicelli stricti erecti circ. 1 cm. longi bracteis intimis amplexicaulibus cincti. Calyx magnus circ. 1 cm. longus foliaceus submembranaceus ad medium vel ultra 5-lobatus, dorso glabro striato ; lobi rotundati crenulati eciliati. Corolla lutea aperte cupulari-campanulata circ. 2 cm. longa extus squamulis scintillantibus lepidota intus glabra 5-loba ; lobi lati rotundati circ. 1 cm. longi 1.5 cm. lati. Stamina 10 subaequalia corolla breviora stylo longiora ; filamenta supra basim glabrum villosa ; antherae aurantiaco-rubrae 5 mm. longae. Discus puberulus. Gynaeceum ad 1 cm. longum ; ovarium petasiforme circ. 3 mm. longum truncatum sulcatum, squamulis stipitatis albidis carnosulis dense obsitum ; stylus validus brevis basi lepidotus decurvus apice clavatus. Capsula ovoidea calyce saepe rubro inclusa, valvis 5 dehiscens.

a few peziza-like glistening orange scales, margin shortly whitely ciliate ; inner bracts about 1 mm. long clasping the pedicel and persisting as a sheath round it even until fruit is formed ; bracteoles about 1.3 cm. long longer than pedicel linear pilose and white-hair-crested elepidote ; pedicel red-tinted densely bristly elepidote barely 1 cm. long not swollen below the calyx. Calyx large foliaceous membranous about 1 cm. long campanulate yellowish outside glabrous divided to middle or beyond into 5 subequal rounded crenulate lobes about 1 cm. broad with fan-spreading veins eciliate. Corolla fleshy yellow open cup-shaped-campanulate about 2 cm. long lepidote outside with glistening scales glabrous inside, at the base forming a wide short tube slightly compressed laterally expanding into a broad 5-lobed limb ; lobes broad imbricate about 1 cm. long 1.5 cm. broad. Stamens 10 subequal, five a very little shorter than the other five all shorter than corolla ; filaments fleshy stout dilated downwards naked at very base above that villous to mouth of basal narrower part of corolla ; anthers oblong orange-red about 5 mm. long. Disk puberulous below the ovary. Gynaeceum about 1 cm. long shorter than stamens ; ovary dome-shaped truncate grooved about 3 mm. long densely clad with white mushroom-like somewhat succulent stalked scales ; style stout slightly decurved with some white scales at the base broadened into a clavate tip below the lobulate stigma. Capsule ovoid with style persistent until dehiscence lepidote outside completely enclosed in the persistent slightly enlarged somewhat hardened striate often red calyx, dehiscing to base by 5 valves.

N.W. Yunnan. Kari Pass, Mekong-Yangtze divide. Lat. 27° 40′ N. Alt. 12,000–13,000 ft. On ledges of cliffs. Shrub of 2 ft. [In fruit.] G. Forrest. No. **12,942.** Aug. 1914.

Yunnan. [Without precise locality.] Duplicate in mature fruit. G. Forrest. No. **13,574.** Oct. 1914.

N.W. Yunnan. Mekong-Salween divide. Lat. 28° 20′ N. Alt. 12,000 ft. On boulders and ledges of cliffs. Shrub of 1–2 ft. Flowers bright yellow. G. Forrest. No. **14,059.** June 1917.

Yunnan. [Without precise locality.] G. Forrest. No. **15,288.**

N.W. Yunnan. Mekong-Salween divide. Lat. 28°. Alt. 10,000–11,000 ft. Duplicate. G. Forrest. No. **16,558.** June 1918.

Yunnan. [Without precise locality.] G. Forrest. No. **17,352.** Duplicate in fruit. Oct. 1918.

A lovely species of the affinity of *Rh. sulfureum*, Franch. In the dried specimens the bright green of the upper-leaf surface and the grey-white of the under surface combined with the bright

yellow of the flower are a pleasing colour-blend, and as the plant is a dwarf with abundance of close-set foliage it should be an effective rock-garden plant. To my eye it is in the dried specimen one of the most charming of the dwarf Rhododendrons which Forrest has collected. Those who have flowered *Rh. sulfureum*, Franch. in cultivation obtain a suggestion of our plant from it. But *Rh. megeratum* is smaller leaved and the grey-white under leaf is much brighter and the flowers are larger.

Rhododendron nakotiltum,* Balf. f. et Forrest.†

Shrub about 3.5 m. high with stout branches. Branchlets a year old about 5 mm. in diameter bright green and sprinkled with whitish and reddish floccose branched hairs, older branches purple glabrescent. Foliage-leaf buds unknown. Leaves petiolate as much as 13.5 cm. long; lamina oblong or obovate-oblong or somewhat oval-lanceolate about 11 cm. long and 3.5 cm. broad, apex somewhat beaked ending in a short horny mucro, margin cartilaginous almost flat, base broadly obtuse; upper surface opaque dark green shagreened (when dry) more or less clad with vestigial floccose hairs, midrib grooved lined with floccose hairs primary veins about 12 on each side hardly visible; under surface buff-coloured covered everywhere with indumentum obscuring the venation excepting the midrib, rosette-hairs of the indumentum of two forms, small persistent white with prostrate broad short vesicular branches, larger with long ascending vesicular thinner branches forming an upper more

* *ναχότιλτος*, having the wool plucked off—*in allusion to the fall of the* upper stratum of indumentum.

† *Rhododendron nakotiltum*, Balf. f. et Forrest.—Frutex ad 3.5 m. altus ramis crassis primo viridibus et conspersim floccosis demum erubescentibus glabrescentibus. Folia petiolata ad 13.5 cm. longa; lamina oblonga vel obovato-oblonga vel subovali-lanceolata ad 11 cm. longa, 3.5 cm. lata subrostrata basi late obtusa; supra opaca olivacea glabrescens sed pilorum vestigiis notata; subtus pallide fulva costa media pallidiore prominula ubique indumento bistrato induta, pilis indumenti rosulatis strati superi detersilis e ramulis ascendentibus latis vesicularibus brunnescentibus, strati inferi persistentis e ramulis brevibus vesicularibus albidis prostratis constructis; petiolus viridis paullo alatus ad 2 cm. longus plus minusve floccosus. Inflorescentia umbellata 12–15-flora; bracteae extimae crustaceae rotundatae mucronatae intus dense glandulosae et puberulae extus furfuraceae, intimae spathulatae submembranaceae extus intusque sericeo-pilosae; bracteolae filiformes ad apicem paullo clavatae pedicellis breviores; pedicelli circ. 2 cm. longi eglandulosi dense floccoso-pubescentes. Calyx parvus circ. 1.5 mm. longus carnosulus 5-lobus; lobi rotundati dorso glabri margine sparsim ciliati. Corolla pallide rosea kermesino-variculosa maculata aperte campanulata circ. 3.5 cm. longa extus glabra intus sparsim puberula 5-loba; lobi lati circ. 1.2 cm. longi 2.2 cm. lati. Stamina 10 inaequalia corolla gynaeceoque breviora; filamenta dense puberula. Discus glaber. Gynaeceum corolla brevius; ovarium cylindricum truncatum dense floccosum eglandulosum; stylus glaber.

or less deciduous stratum and becoming brown, midrib elevated less hairy and paler in colour; petiole bright green slightly winged grooved above as much as 2 cm. long always more or less clad with floccose hairs. Flowers 12–15 in a compact terminal umbel; bracts persistent at first flower-opening, outer sterile thick crustaceously leathery chestnut-brown rounded-ovate mucronate keeled inside densely glandular and puberulous towards the top floccose, the glands capitate orange-coloured short-stalked, outside furfuraceously puberulous at top and over mucro red- or white-floccose; intermediate are membranous and broadly ovate-oblong; inner fertile bracts long spathulate nearly 4 cm. long and 1 cm. broad more or less membranous, outside and inside densely covered with white curled adpressed hairs, mucronate at the apex and there hair-crested with red or white hairs; bracteoles filiform slightly clavate at tip hairy from the base about 1.2 cm. long shorter than pedicels; pedicels about 2 cm. long eglandular densely floccose-pubescent. Calyx small about 1.5 mm. long fleshy cut to near base into 5 rounded lobes which are glabrous on the back and have a few marginal cilia. Corolla pale rose with a posterior basal crimson blotch and a few crimson spots above it, openly campanulate from the base about 3.5 cm. long slightly oblique, outside glabrous, inside at base puberulous, 5-lobed; lobes short and broad about 1.2 cm. long and 2.2 cm. broad emarginate and undulate. Stamens 10 unequal shorter than corolla and gynaeceum, longest about 2.4 cm. long with anthers about 3 mm. long, shortest about 1.3 cm. long with anthers 2.5 mm. long; filaments stoutish dilated downwards and from the base densely puberulous to above the ovary. Disk apparently glabrous. Gynaeceum about 2.8 cm. long shorter than corolla; ovary about 5 mm. long cylindric truncate grooved completely covered by an indumentum of floccose somewhat fasciate reddish and uncoloured ascending adpressed hairs, eglandular; style glabrous pale-coloured slightly expanding below the dark-coloured lobulate lipped stigma.

W.N.W. Yunnan. Mekong-Salween divide. In pine forests. Alt. 11,000–12,000 ft. Lat. 28° 20′ N. Flowers pale rose with a blotch of crimson at base. G. Forrest. No. **14,060.** June 1917.

One of these N.W. Yunnan Rhododendrons, with bistrate indumentum on the under-leaf surface, which occupy a position in the genus somewhere between the Lacteum series and the Roxieanum series. It sheds its upper stratum of indumentum leaving the under stratum as a whitish layer. The prominent red blotch at the base of the corolla is a distinguishing mark of the species amongst its allies.

Rhododendron planetum,* Balf. f.†

Shrub with stout branches. Branches a year old as much as 7 mm. in diameter green more or less clad with a white detersile indumentum of intricately interwoven long branching somewhat vesicular whitish hairs, older branches glabrous. Foliage-buds ovoid somewhat glutinous ; outer scale-leaves broad semi-lunate with smooth margin, followed by more ovate ones and then oblong-oval ones, all more or less puberulous outside the inner ones most so and sticky, the margins only sparsely ciliate and with glutinous hairs ; young leaves revolute. Leaves petiolate as much as 22 cm. long ; lamina leathery oblong or elongated narrow oval as much as 20 cm. long 6 cm. broad obtuse or subacute ending in a red tuberculate mucro, margin slightly cartilaginous, base cuneate and extending as a distinct narrow wing on each side of petiole to its base ; upper surface bright green smooth glabrous save for the reddened narrowly grooved midrib which has vestiges of floccose hairs, primary veins some 20 on each side slightly grooved ; under surface pale green marked by the red-tinted reticulation of the ultimate submerged veins, midrib reddened large prominent, primary veins reddened slightly raised, whole surface sprinkled with vestiges of detersile indumentum particularly at the base and along the side of the midrib and along the primary veins, hairs of the indumentum floccose and much branched often vesicular but also sebaceous and especially on midrib glandular some branches ending in a rounded or ovoid gland, also short-stalked glands occur intermixed with the hairs, older leaves often appearing quite glabrous ; petiole stout about 2 cm. long distinctly winged and grooved (puberulous in groove) clad like the stem with indumentum

* *πλανητός*, wandering—in allusion to its appearance in cultivation as a "rogue."

† *Rhododendron planetum*, Balf. f.—Frutex ramis crassis. Rami annotini circ. 7 mm. diam. virides indumento tomentoso detersili plus minusve vestiti demum glabrescentes. Alabastra ovoidea glutinosa perulis puberulis extimis semilunatis neque acuminatis nec caudatis vix ciliatis. Folia ad 22 cm. longa petiolata ; lamina coriacea elongato-ovalis vel oblonga ad 20 cm. longa 6 cm. lata obtusa vel subacuta basi cuneata in petiolum decurrens ; supra laete viridis laevis glabra (costa media anguste sulcata excepta) venis primariis utrinsecus circ. 20 ; subtus pallide viridis pilis ramosis floccosis et glandulis conspersa costa media elevata ; petiolus crassus tomentosus glabrescens. Umbella terminalis circ. 8-flora ; bracteae extimae rotundatae truncatae ; intimae oblongo-spathulatae sericeae ; bracteolae circ. 1.5 cm. longae pilo-cristatae ; pedicelli vix 2 cm. longi glandulosi. Calyx parvus vix 1 mm. longus glaber 5-lobatus ; lobi semilunati. Corolla infundibuliformi-campanulata subregularis ad 5.5 cm. longa pallide rosea emaculata glabra 7-loba ; lobi rotundati emarginati circ. 1.2 cm. longi 2.4 cm. lati. Stamina 10 inaequalia corolla gynaeceoque multo breviora ; filamenta puberula ; antherae atro-coccineae. Discus viridis glaber. Gynaeceum corolla paullo brevius ; ovarium glabrum latum petasiforme circ. 5 mm. longum ; stylus glaber ; stigma latum discoideum lobulatum.

which is detersile and may leave the petiole glabrous. Flowers in a terminal about 10-flowered umbel the rhachis hardly elongated ; outer bracts rounded truncate mucronulate more or less puberulous outside, inner bracts oblong-spathulate 3.5 cm. long 1 cm. or more broad apiculate silky ; bracteoles about 1.5 cm. long filiform with long wavy hairs from the base and at the top densely clothed with straight erect hairs forming a hair-crest ; pedicels under 2 cm. long green glandular with short-stalked globose glands, not swollen below calyx. Calyx small about 1 mm. long green or pink showing 5 half-moon-shaped lobes glabrous or with an occasional gland. Corolla as much as 5.5 cm. long funnel-shaped campanulate from the base pink often showing deeper tinted interpetaline lines glabrous inside and outside somewhat fleshy, at base of tube gibbous and retuse ; limb expanding into 7 erect emarginate rounded lobes as much as 1.2 cm. long 2.4 cm. broad. Stamens 14 unequal much shorter than corolla and gynaeceum, longest about 3 cm. long with anther 2.5 mm. long, shortest about 1.7 cm. long with anther 1.5 mm. ; filaments widened downwards puberulous towards base ; anthers black-crimson. Disk green glabrous. Gynaeceum a little shorter than corolla ; ovary broad dome-shaped with rounded top not conspicuously grooved most glabrous about 5 mm. long ; style glabrous pink-tinted slightly swollen below the broad discoid lobulate stigma.

Szechwan. Wilson.

Mr. J. C. Williams gives me the following history of this plant, of which he has sent to me a specimen from Caerhays :—" It was a rogue which I found at Coombe Wood in a bed with the label 1882. Harrow was quite certain it had no relationship to any of his hybrids. I remember turning to them and going over the bed to see if I could find anything like it and I was unable to. I am unable to find anything like it here. As to what 1882 was as regards the other plants I am unable to remember and only know that it seemed plain to me there was no relationship direct or indirect between them. I have never let this plant get out of touch with me since it came here." Mr. Williams gives the following copy of Wilson's Field Note :— " 1882. Rhododendron. Bush 4–12 ft. Rose. Mts. Tatsienlu. Leaves ovate-cordate " ; and adds the note, " in this case is not in his handwriting." 1882 is not attached in Plantae Wilsonianae to a Rhododendron. It is clear that the label copied by Mr. Williams does not apply to *Rh. planetum*—the description of the leaves of 1882 as " ovate-cordate " indicates a different plant. I cannot match what I am calling *Rh. planetum* with any known species. The look of the foliage and flower-truss and flower suggests the Decorum series. It has the long leaves of *Rh.*

discolor, Franch. of that series and the funnel-shaped campanulate corolla that is typical of that series. But then it shows a glabrous dome-shaped ovary and style and not the glandular ovary which marks the Decorums. In this character of dome-shaped glabrous ovary and glabrous style it is associated with *Rh. calophytum*, Franch., and *Rh. sutchuenense*, Franch., and it has the long leaves of these species with a detersile indumentum on the lines of that of *Rh. sutchuenense*, though not just similar. But it has a 7-lobed corolla of altogether different shape. Here it is funnel-shaped campanulate erect with radiating subequal lobes, in these two species the corolla is obliquely campanulate. It seems to occupy a position between the true Decorums and the group which includes *Rh. calophytum* and *Rh. sutchuenense*, which two species come near the members of the Grande series, different however in their glabrous ovary.

4404 **Rhododendron pothinum,*** Balf. f. et Forrest.†

A shrub about 1 m. high with twiggy thin slightly nodular branches about 2 mm. in diameter when a year old and then red and covered with red bristles, annual growths usually short bearing rosette-clusters of some 5–8 leaves, scale-leaves of the foliage-buds falling early, bristles sometimes falling early leaving scars but usually some persistent for several years on the grey surface. Foliage-buds narrow fusiform pointed; outermost scale-leaves crustaceous rounded at base with an acuminate tail or apiculus about 5 mm. long, followed by longer oblong oboval ones all keeled slightly puberulous outside and with dense hair-covering at the mucro, more or less ciliate; innermost scale-leaves greenish-yellow membranous oblong-spathulate about 1.5 cm. long 4 mm. broad rounded at top mucronate ciliate; young leaves revolute in bud sparingly floccose on upper surface glabrous on under surface save for some hairs on midrib. Leaves shortly petiolate as much as 7.5

* *ποθινός*, much desired—as a plant for our gardens.

† *Rhododendron pothinum*, Balf. f. et Forrest.—Frutex ad 1 m. altus. Ramuli tenues setuliferi demum subnodulosi. Alabastrorum perulae deciduae. Folia petiolata ad 7.5 cm. longa; lamina subcoriacea ovalis vel obovalis ad 7 cm. longa 2.5 cm. lata, apice obtusa vel rotundata mucronata, margine cartilaginea plana vel leviter recurva, basi obtusa; supra olivacea laevis glabra; subtus griseo-viridis vel flavido-viridis glabra, costa media rubescente elevata, venis primariis nunc sparsim floccosis basique setuliferis; petiolus circ. 5 mm. longus rubidus setuliferus. Umbella 4-5-flora; pedicelli circ. 1 cm. longi rubri eglandulosi longe floccosi. Calyx ad 3 cm. longus extus glaber 5-partitus; lobi rubri subcarnosuli rotundati margine floccosi persistentes. Corolla campanulata ad 3.5 cm. longa coccinea emaculata glabra; lobi 5 rotundati emarginati. Stamina 10 corolla multo breviora; filamenta glabra. Discus glaber. Gynaeceum corolla brevius staminibus paullo longius; ovarium ad 4 mm. longum petasiforme truncatum sulcatum eglandulosum floccoso-tomentosum; stylus glaber. Capsula cylindrica circ. 1 cm. longa plus minusve setosa calyce aucto ultra medium inclusa.

cm. long ; lamina thinly leathery oblong-oval or oboval as much as 7 cm. long 2.5 cm. broad, apex obtuse or rounded with a short projecting red tuberculate mucro, margin cartilaginous plane or slightly recurved sometimes roughened and with an occasional bristle towards base, base obtuse ; upper surface mat olive-green smooth glabrous save grooved midrib which may have some floccose hairs at base and some red bristles, primary veins some 7 or 8 on each side concealed ; under surface grey green marked by the red veinlets of the ultimate venation, glabrous or with some whitish or reddish floccose hairs on elevated often red midrib and hardly raised primary veins sometimes also a few red bristles on midrib and veins particularly at the base ; petiole reddened about 5 mm. long grooved bearing red bristles often densely covered by them. Flowers in a terminal 4–5-flowered umbel ; bracts and bracteoles falling as the flowers open ; pedicels red about 1 cm. long rarely longer densely floccose with long stalked flocks with erect branches eglandular, swollen at the top. Calyx bright red conspicuous with a darker crimson cup, about 3 cm. long divided to base or near it into 5 rounded somewhat unequal slightly fleshy lobes broader than long about equal to cup in length glabrous outside floccose-ciliate persistent. Corolla deep crimson without spots slightly more darkly blotched at base posteriorly campanulate about 3.5 cm. long somewhat fleshy at base and 5-gibbous with faint interpetaline ridges inside, glabrous outside and inside ; lobes large rounded about 1.5 cm. long 2 cm. broad emarginate. Stamens 10 slightly unequal longest about 2.2 cm. long shortest about 1.8 cm. long shorter than corolla and gynaeceum ; filaments slightly dilated downwards glabrous ; anthers about 2 mm. long. Disk glabrous. Gynaeceum not 2.5 cm. long shorter than corolla slightly longer than stamens ; ovary stout dome-shaped deeply grooved truncate about 4 mm. long tomentose with long stalked freely branched fasciate floccose hairs eglandular ; style glabrous stout dilated below the lobulate stigma. Capsule a little over 1 cm. long cylindric bristly or warted by scars of bristles, through more than half its length enclosed in accrescent brown leathery calyx, dehiscing to base from apex by 5 woody valves.

S.E. Tibet. Tsarong. On Doker-la. Mekong-Salween divide. Lat. 28° 25′ N. Alt. 13,000–14,000 ft. On open bouldery slopes. Shrub of 2–3 ft. Flowers deep crimson. G. Forrest. No. **16,702.** June 1918.

Rh. pothinum in dried specimens gives all the promise of a bright garden plant deserving the name that is attached to it.

The species is a near ally of *Rh. eudoxum,* Balf. f. et Forrest, and comes from the same region of S.E. Tibet. The similarity in general appearance of the plants in dried specimens is so great

that at sight one might assume that they were the same, but careful examination of them brings out so many differences that their specific union is not justifiable. A prominent feature of difference is the bristly covering of the stems when well developed in *Rh. pothinum*, a covering which spreads up on to the petiole and the base of the leaves. The bristles often are so many as to make the surface quite shaggy and yet in other cases they are so few as to be found with difficulty. With these bristles there are no glands. In *Rh. eudoxum* on the other hand this bristliness is never very marked and may disappear, but there are always glands which are not found on the stem or petiole of *Rh. pothinum*. Then the underleaf surface of *Rh. pothinum* wants the indumentum of *Rh. eudoxum*, and other points of difference are the shorter eglandular pedicels of *Rh. pothinum*, its smaller calyx with lobes glabrous outside and only flock-fringed, its unspotted corolla, glabrous stamens, gynaeceum much shorter than the corolla, tomentose eglandular ovary and stouter style.

Other species with which *Rh. pothinum* is allied are *Rh. temenium*, Balf. f. et Forrest and *Rh. trichomiscum*, Balf. f. et Forrest. See p. 169.

4905 **Rhododendron preptum,*** Balf. f. et Forrest.† (Falconeri.)

Tree with stout branches as much as 5 cm. in diameter when a year old densely tomentose the tomentum persisting more or less for several years. Leaves petiolate as much as 18 cm. long ; lamina thickly leathery wider above the middle elongated-obovate as much as 16 cm. long 7 cm. broad, rounded at apex and with a prominent red-tipped mucro over 1 mm. long, margin cartilaginous plane slightly undulate, base obtuse ; upper surface

* πρεπτός, distinguished—in allusion to its large leaves and flower-truss.

† *Rhododendron preptum*, Balf. f. et Forrest.—Arbor parva ramis crassis tomentosis. Folia petiolata ad 18 cm. longa ; lamina crasse coriacea oblongo-obovata ad 16 cm. longa 7 cm. lata, apice rotundata mucronata, margine cartilaginea paullo undulata, basi obtusa ; supra glabra opaca olivacea, costa media sulcata, venis primariis utrinsecus circ. 10 paullo sulcatis ; subtus pallide fulva ubique indumento tomentoso bistrato vestita, pilis strati superi detersilibus elongato-cupuliformibus longe stipitatis laxe ramulosis, strati inferi rosulatis ramulos vesiculosos emittentibus in pelliculam albidam crustaceam agglutinatis ; petiolus crassus vestigiis indumenti albidis indutus ad 2 cm. longus. Inflorescentia racemoso-umbellata circ. 20-flora, rhachi circ. 3.5 cm. longa tomentosa ; pedicelli 2 cm. longi vel breviores dense tomentosi sub flore oblique expansi. Calyx parvus vix 1.5 mm. longus dentatus dense tomentosus. Corolla oblique campanulata circ. 3.5 cm. longa carnosula lacteo-alba varo basali atro-coccineo notata glabra 8-loba ; lobi rotundati vel subtruncati circ. 1 cm. longi 1.4 cm. lati. Stamina 16 corolla gynaeceoque multo breviora ; filamenta deorsum paullo dilatata puberula ; antherae pallidae. Discus glaber. Gynaeceum circ. 3 cm. longum corolla paullo brevius ; ovarium conoideum truncatum dense tomentosum ; stylus glaber crassus sub stigmate discoideo lobulato recurvo expansus.

mat olive-green glabrous slightly rugulose not shagreened midrib grooved often purpled, primary veins some 10–11 on each side slightly grooved ; under surface everywhere clad with a pale buff-coloured bistrate indumentum the raised midrib and primary veins also forming a non-scintillating somewhat woolly layer, upper stratum more or less detersile composed of long stalked narrow funnel-shaped cups, the stalk many-celled giving off a few branches, the cup also giving off branches from the sides outside hardly forming a rim and deliquescing into many twisted branches, the branching so free as sometimes to obscure the cup form, under stratum of rosette-hairs with short stalk and spreading thin-walled vesicular agglutinate branches forming a white persistent crust under the upper stratum and exposed when the latter falls ; petiole stout about 2 cm. long 4 mm. in diameter purple and clad with remains of an indumentum like that of underleaf surface. Flowers in a terminal racemose umbel about 20-flowered, rhachis more or less tomentose about 3.5 cm. long ; pedicels not exceeding 2 cm. in length 1.5 mm. in diameter densely tomentose slightly brown-tinted, at top set on very obliquely to flower. Calyx saucer-shaped small about 1.5 mm. long densely tomentose like the pedicel with short marginal teeth acute or obtuse. Corolla obliquely campanulate fleshy barely 3.5 cm. long on convex side, creamy white with a deep basal crimson blotch darkest on 3 or 4 posterior petals, slightly pouched and retuse at base glabrous outside and inside 8-lobed ; lobes rounded or somewhat truncate and retuse about 1 cm. long 1.4 cm. broad. Stamens 16 unequal much shorter than corolla and gynaeceum ; filaments slightly expanded downwards puberulous ; anthers pale about 3 mm. long. Disk small glabrous. Gynaeceum about 3 cm. long a little shorter than corolla ; ovary conoid truncate grooved densely tomentose with fasciate erect closely packed hairs slightly brown-tinted ; style short glabrous expanded at top into a broad discoid lobulate recurving stigma.

N.E. Upper Burma. N'Maikha-Salween divide. Lat. 26° 20′ N. Alt. 11,000 ft. In bamboo and mixed scrub. Shrub of 6–9 ft. Flowers almost gone, yellowish-white or pale yellow with a crimson blotch at base. G. Forrest. No. **18,034**. May 1919.

A species of the Falconeri series finding its nearest ally in *Rh. galactinum*, Balf. f.,* collected by Wilson in Szechwan (*Rh. lacteum*, Rehd. et Wils., in Pl. Wilsonianae, i (1913), 545 in part).

* This plant is Wilson's No. 4254, and is in cultivation but has not yet flowered. Until we have flowers an adequate description is not possible, and the name has been attached to the plant in gardens for convenience of reference and distinction from *Rh. lacteum*, Franch., and *Rh. fictolacteum*, Balf. f. (See Trans. Bot. Soc. Edin., xxvii (1916), 104.)

Of *Rh. galactinum* flower is as yet unknown and the flowers in Forrest's specimen of *Rh. preptum* are few. It is impossible therefore to make a precise comparison of the two species. But whilst their indumentum hairs are much alike and the surfaces upper and under of the leaves have a close resemblance, the form of the leaf at once separates the species. In *Rh. preptum* the leaf is always broadest above the middle, in *Rh. galactinum* at the middle—in *Rh. preptum* they are oblong-obovate or oblong-lanceolate, in *Rh. galactinum* oblong-ovate.

Rhododendron protistum,* Balf. f. et Forrest.† (Grande.)

Robust shrub reaching 9 m. in height. Branches thick when a year old as much as 1 cm. in diameter tomentose with a dense yellowish-grey tomentum of intricately branched long hairs persistent on older stems and becoming a dirty grey before decortication of branches. Foliage-buds unknown. Leaves large petiolate as much as 45 cm. long; lamina thinly leathery lanceolate or oblanceolate as much as 40 cm. long 13 cm. broad many smaller, apex obtuse with a short prominent mucro, margin broadly cartilaginous slightly undulate flat, narrowed to a broadly cuneate base and there slightly decurrent on petiole; upper surface dark green mat rugulose glabrous but coated with a thin dirty grey scurf as if vestiges of a juvenile indumentum, midrib grooved from the base, primary veins as many as 26 on each side at first spreading from midrib at a wide angle often nearly horizontal then curving upwards towards margin; under surface opaque green but veiled by a thin stratum of white cobwebbed hairs mixed with rosette-hairs, at base and margin of leaf often forming a grey-white complete indumentum, the hairs hardly agglutinate, midrib prominent dark purple-red with a few cobwebbed hairs; petiole as much as 5 cm. long stout grooved glabrescent but showing vestiges of withered cobwebbed

* πρώτιστος, first of the first—in allusion to its merits.

† *Rhododendron protistum*, Balf. f. et Forrest.—Frutex robustus ad 9 m. altus. Rami crassi tomentosi. Folia petiolata ad 45 cm. longa; lamina tenuiter coriacea lanceolata vel oblanceolata ad 40 cm. longa 13 cm. lata, apice obtusa, margine cartilaginea, deorsum attenuata basi late cuneata; supra atroviridis glabra pilorum juvenilium vestigiis conspersa; subtus albida vel viridis indumento tenui pilorum arachnoideorum intricatim intertextorum constructo induta; petiolus crassus ad 5 cm. longus sulcatus glabrescens. Inflorescentia racemo-umbellata 30-flora (vel ultra), rhachi ad 6 cm. longa arachnoidea; bracteae fertiles magnae ad 6 cm. longae 2 cm. latae obovato-oblongae truncatae apiculatae utrinque sericeae; bracteolae breves circ. 5 mm. longae sericeae; pedicelli vix 2 cm. longi validi tomentosi. Calyx parvus ad 3 mm. longus minute dentatus tomentosus. Corolla carnosula flavido-alba basi roseo-suffusa oblique campanulata 8-loba. Stamina 16 inaequalia gynaeceo breviora; filamenta glabra. Discus glaber. Gynaeceum corolla paullo brevius; ovarium ovoideum 16-loculare sulcatum dense lanato-tomentosum indumenti pilis fasciatis; stylus glaber.

hairs. Inflorescence a racemose-umbel of many (30 or more) flowers, rhachis as much as 6 cm. long cobwebbed ; outer bracts unknown, inner fertile bracts oblong-spathulate truncate apiculate as much as 6 cm. long 2 cm. broad inside and outside sericeous, margin slightly ciliate ; bracteoles linear barely 5 mm. long densely sericeous ; pedicels short stout about 1.5 cm. or a little more long enwrapped in a thin ochre-coloured indumentum of cobwebbed hairs slightly swollen below the flower to which it is only slightly oblique. Calyx minute about 3 mm. long with 8 unequal deltoid teeth the larger sometimes twice as long as the cup tomentose like the pedicel. Corolla fleshy creamy-white flushed rose campanulate oblique about 5.5 cm. long on posterior side, the petals slightly pouched at base of tube, glabrous outside and inside 8-lobed ; lobes a little over 1 cm. long 2 cm. broad. Stamens 16 unequal shorter than corolla and gynaeceum, longest as much as 4.5 cm. long shortest as much as 3.5 cm. ; filaments slender slightly wider at base, glabrous ; anthers oblong about 4 mm. long. Disk glabrous. Gynaeceum a little shorter than corolla ; ovary ovoid about 8 mm. long 16-locular grooved pink-tomentose being clad with fasciate hairs having short and thin stalks and long curling branches which form a loose woolly surface ; style glabrous clavate under the large discoid lobed stigma.

W. N.W. Yunnan. Mekong-Salween divide. Lat. 28° N. Alt. 13,000 ft. In Rhododendron forest. Shrub of 20–30 ft. Flowers fleshy creamy-white flushed rose. G. Forrest. No. **16,351.** May 1918.

This fine species must be placed in the Grande series. It differs in the indumentum from other members of the series. We have not sufficient material for ascertaining the history of development of the coating of the under surface of the leaves, but what we have suggests that in the young state the leaves are clad like others of the series with a white indumentum of cobwebbed and rosette-hairs. As the leaf oldens this withers on the upper surface in the usual fashion, but on the under surface it seems to disappear more or less over a large area of the surface save for a thin weft covering it like a fungus-mycelium. The green epidermis beneath it is visible. On other parts of the surface the indumentum persists and forms a white crust like that characteristic of the Grande series. There is no species in the series to which *Rh. protistum* has a specially near alliance unless it be *Rh. grande* or *Rh. argenteum*. It can be readily recognised by the broad lanceolate or oblanceolate somewhat thin leaves with the indumentum-character mentioned and it has a 16-chambered ovary.

2921

Rhododendron pubescens,* Balf. f. et Forrest. (Scabrifolium.)

Much and intricately branched very leafy shrub of a little over 1 m. high with thin short yellowish branches (when a year old a little over 1 mm. in diameter) densely pubescent with white shorter hairs and also longer somewhat setulose hairs intermixed with stalked concave reddish or orange infiltrated peltate scales, traces of the long hairs particularly remaining on the dark grey older twigs until decortication, bearing many small leaves arranged along the length of the year's shoot and persisting some of them for two or three years, many leaves clustered around the apical bud to which the last leaves reduced in size are adpressed as an outer bud-covering. Foliage-bud small the outer scales triangular acuminate keeled densely pubescent outside ciliate mucronate, inner scales more ovate and thinner; young leaves conduplicate-convolute. Leaves shortly petiolate as much as 2.5 cm. long; lamina thick leathery narrowly oblong or oblanceolate or lanceolate as much as 2.2 cm. long 6 mm. broad, acute with a rounded mucro red tuberculate, margin revolute, base cuneate; upper surface dark green mat densely pubescent with white hairs and longer seta-like hairs also bearing a few distant stalked red or orange peltate scales and otherwise pitted with discontiguous pits out of which stalked peltate scales have fallen, no asperities towards the margin, midrib grooved and lined with hairs, primary veins not visible; under surface paler green-grey setulose and also pilose more densely than upper surface and with peltate scales like those of that surface only more of them, midrib raised and coated like the surface; petiole about 3 mm. long grooved red at base when young clad at base like the stem. Umbels 3–4-flowered several fascicled on each shoot one in axil of each of the upper-

* *Rhododendron pubescens*, Balf. f. et Forrest.—Frutex nanus circ. 1 m. altus. Rami tenues (annotini flavidi circ. 1 mm. diam.) pilis albidis et brevibus et longis setuliformibus squamulas aurantiacas intermixtas obtegentibus dense pubescentes. Alabastra parvula; perulae extus lepidotae puberulaeque, margine minute albo-ciliatae. Folia petiolata ad 2.5 cm. longa; lamina coriacea ad 2.2 cm. longa 6 mm. lata anguste oblonga vel oblanceolata vel lanceolata, acuta mucronata, margine revoluta, basi cuneata; supra olivacea opaca pilis brevibus et setuliformibus dense pubescens et squamulis paucis aurantiacis conspersa sed squamularum plurimarum foveis vacuis notata, costa media sulcata pubescente et lepidota, venis primariis occultis; subtus pallidior griseo-viridis, ut supra sed densius vestita, costa media elevata; petiolus circ. 3 mm. longus plus minusve rubidus pubescens et lepidotus. Umbellae laterales 3–4-florae ad apicem ramulorum fasciculatim aggregatae; bracteae extus puberulae et lepidotae; pedicelli 6–8 mm. longi puberuli setulosi et lepidoti. Calyx parvulus circ. .5 mm. longus annularis extus puberulus et lepidotus margine undulatus pilosus et setulosus. Corolla parva circ. 8 mm. longa; tubus infundibuliformis intus puberulus; lobi 5 oblongo-ovales extus lepidoti. Stamina 10 inaequalia, longissima corollam excedentia; filamenta puberula. Gynaeceum corolla et staminibus longius. Capsula oblonga recta circ. 6 mm. longa 2.5 mm. diam. puberula et lepidota.

most leaves, never terminal; outer bracts leathery rounded mucronulate, lepidote and puberulous outside, finely shortly ciliate on margin; inner bracts more oblong; bracteoles unknown; pedicels about 6–8 mm. long clad with setae short hairs and peltate scales. Calyx minute about .5 mm. long forming a fleshy ring with an indication on margin of 5 lobes, densely hairy and lepidote outside the margin of the lobes more or less setulose. Corolla small about 8 mm. long with a short funnel-shaped tube puberulous inside expanding into a 5-lobed limb; lobes oblong-oval lepidote outside longer than the tube. Stamens 10 unequal the longest a little longer than the corolla, shortest about 5 mm. long; filaments filiform with a tuft of hairs above the glabrous base. Gynaeceum longer than corolla and stamens. Young fruit green narrowly oblong-ovoid puberulous and lepidote; style glabrous. Capsule oblong straight about 6 mm. long 2.5 mm. in diameter finely pilose and lepidote.

S.W. Szechwan. Mu-li Mts. Lat. 28° 12′ N. Alt. 10,000 ft. In thickets and amongst scrub. Shrub of 3–4 ft. In fruit. G. Forrest. No. **16,812.** Aug. 1918.

The date of collection of specimens of this species has not been favourable. The flowers are all gone, only a few withered ones remaining on the young fruit. The fruits are not mature. The leaf-buds are hardly formed. Notwithstanding these deficiencies the species is so distinct I am able to describe it, although imperfectly. It belongs to the phylum of *Rh. mollicomum*, Balf. f. et W. W. Sm., and *Rh. hemitrichotum*, Balf. f. et Forrest. The latter species with its white wax-covered underleaf without hairs (save on midrib) and buds cobwebbed with hairs is easily diagnosed. The former is a nearer ally but without the bristle-shaped hairs of *Rh. pubescens*, has buds with long cilia, and much larger flowers. They all belong to the Scabrifolium series, but none of them have the asperities near the margin of the leaf on its upper side that are so prominent in *Rh. scabrifolium* and other members of the series.

4907 **Rhododendron pyrrhoanthum,*** Balf. f.†

Prostrate shrub with stout branches those a year old green glabrous as much as 4 mm. in diameter bearing leaves resembling

* *πυρρός*, red.

† *Rhododendron pyrrhoanthum*, Balf. f.—Frutex prostratus. Rami validi virides ad 4 mm. diam. glabri. Folia petiolata circ. 8 cm. longa; lamina coriacea convexa oblongo-ovalis ad 7 cm. longa 3.5 cm. lata, obtusa, margine cartilaginea recurva, basi obtusa; supra atroviridis rugulosa, costa media venisque primariis in sulcis profundis impressis, glabra (costa media puberula excepta); subtus concava pallide flavido-viridis glandulis floccisque sebaceis sparsim conspersa costa media venisque primariis prominulis; petiolus circ. 1 cm. longus erubescens sulcatus et in sulco puberulus. Flores in umbellam paucifloram terminalem dispositi; bracteae sub anthesi persistentes intimae membranaceae obovato-

in appearance those of *Rh. zeylanicum* only smaller. Leaves petiolate about 8 cm. long; lamina leathery convex above oblong-oval, as much as 7 cm. long 3.5 cm. broad, apex obtuse mucronate, margin cartilaginous recurved, base obtuse; upper surface dark green glabrous excepting the midrib which is lined by withered hairs, midrib deeply sunk between the convex halves of the lamina on which the primary veins some 14 on each side are deeply sunk, ultimate veinlets forming a reticulum on the surface; under surface paler, yellow-green, with raised paler midrib and primary veins thinly sprinkled with short glands and irregularly branched small floccose hairs; petiole stout about 1 cm. long pinkish grooved above and there glandular and puberulous, elsewhere glabrous. Flowers in a small 5-flowered open terminal umbel the bracts remaining during flower-expansion; bracts outermost leathery ovate apiculate keeled, followed by more ovate, then rounded ones all more or less floccose and glandular outside and ciliate with greasy fasciate hairs; innermost bracts obovate spathulate reflexing from above the middle somewhat membranous greenish-yellow sticky, outside more or less floccose and glandular, margin densely ciliate with fasciate hairs and especially so around the mucro; bracteoles short about 5 mm. long white subulate hairy in upper part; pedicels unequal as much as 3 cm. long stout pink-tinted and thinly clad with fasciate floccose hairs and white stalked glands. Calyx saucer-shaped about 2 mm. long crimson; tube showing 5–6 glistening glabrous pouches; lobes 5 half-moon shaped glabrous outside but finely ciliate with short white flock-hairs and glands. Corolla blood-red campanulate unspotted and with faintest indication of a darker blotch a little above base of posterior petal, nearly regular about 3.5 cm. long glabrous inside and outside; tube fleshy at the base retuse with 5 pouches and 5 deep interpetaline grooves outside correspondingly ridged inside; limb with 5 thinner recurving rounded emarginate lobes each about 8 mm. long 2 cm. broad. Stamens 10 slightly unequal bunched in the middle of corolla-bell shorter than tube of corolla and than gynaeceum, longest about 2.5 cm. long shortest about 1.8 cm.; filaments white fleshy slightly dilated to the base very shortly puberulous in lower portion; anthers ochre-coloured about 2.5 mm. long. Disk green lobulate puberu-

spathulatae glandulosae et floccosae; bracteolae breves circ. 5 mm. longae; pedicelli glandulosi et floccosi ad 3 cm. longi. Calyx ruber glaber nitidus parvus circ. 2 mm. longus gibbosus 5-lobus; lobi semilunati extus glabri minute ciliati. Corolla sanguinea tubulosa subangularis circ. 3.5 cm. longa carnosula glabra. Stamina 10 subaequalia corolla multo breviora; filamenta puberula. Discus puberulus. Gynaeceum corolla paullo brevius staminibus longius; ovarium conoideum truncatum circ. 6 mm. longum sparsim puberulum et glandulosum; stylus glaber.

lous. Gynaeceum a little shorter than corolla longer than stamens about 3.2 cm. long; ovary conoid truncate slightly grooved about 6 mm. long thinly puberulous with white fasciate flock-hairs which are intermixed with long-stalked white glands; style white glabrous scarcely enlarged at the tip where it forms a crimson lip around the dark stigmatic lobes.

Yunnan. G. Forrest.

This Rhododendron appeared at Werrington Park in a frame-bed of seedlings of *Rh. repens*, Balf. f. et Forrest. Mr. J. C. Williams tells me it is a plant of prostrate habit like *Rh. repens*, but with much larger leaves. The leaves, as Mr. Williams says, recall in form those of *Rh. zeylanicum*, Hort. and such like forms of *Rh. arboreum*, Sm. and *Rh. Delavayi*, Franch., but all these plants of the Arboreum series have a complete buff-coloured underleaf indumentum concealing the epidermis; here the epidermis is exposed between the scattered hairs and glands. I am impressed by the likeness to *Rh. fulgens*, Hook. f., and this not only in the foliage but also in the flower. · There is no identity here, only an approach. The leaves in *Rh. fulgens* have more indumentum below and the flowers are on short pedicels in dense small trusses and have dark crimson blotches in the pouches of the petals—separating characters of easy recognition; on the other hand the similarity in the calyx with pouches on the tube and of the short tubular campanulate subregular corolla with deep indentations in the tube and the sparingly clad ovary are no less easily seen.

I have named this very distinct plant. There is no specimen of it in Forrest's collections, and if a hybrid origin be assumed for it two lines of parentage might in all the circumstances be suggested; namely, the Arboreum series through some form of *Rh. Delavayi*, and the Forrestii series through some form of *Rh. repens*—the foliage-form and flower-character coming mainly through the former, the habit through the latter. But the divergences from both shown by the plant are great. Mr. Forrest may be able to throw some light on the problem when he returns.

4908 **Rhododendron regale,** Balf. f. et Ward.* (Falconeri.)

Gnarled tree as much as 9 m. high with stout branches and large leaves. Branches a year old as much as 1.2 cm. in diameter

* *Rhododendron regale,* Balf. f. et Ward.—Arbor contorta ad 9 m. alta ramis crassis foliisque magnis. Rami annotini circ. 1.2 cm. diam. pellicula pilorum agglutinatorum grisei. Alabastra ignota. Folia petiolata ad 25 cm. longa; lamina crasse coriacea late oblanceolata ad 20 cm. longa 12 cm. lata, apice rotundata breviter mucronata, margine cartilaginea paullo recurva, deorsum attenuata in petiolum cuneatim subdecurrens; supra opaca atro-viridis leviter rugulosa

ash-grey the colour due to an agglutinate pellicle of hair-indumentum many cells of which become rufous red (the material is not sufficient for accurate further description), vestiges of this pellicle are seen on older parts of branches. Foliage-buds unknown. Leaves petiolate as much as 25 cm. or more long; lamina thickly leathery broadly oblanceolate as much as 20 cm. long 12 cm. broad, apex rounded with a short tuberculate mucro, margin thickly cartilaginous slightly tinted red (recurved in dried specimens), tapering to the somewhat wedge-shaped base where it is prolonged more or less evidently along the petiole; upper surface mat dark olive-green not shagreened and only slightly wrinkled glabrous but for the midrib in the narrow groove of which are white vestiges of hairs like those on the young stems, midrib darker coloured the rest of surface losing its groove and becoming convex as it passes into petiole, primary veins about 15 on each side very shallowly grooved; under surface grey with a prominent thick red-tinted midrib and prominent like-tinted primary veins, the grey surface composed of a bistrate indumentum, the under stratum a grey pellicle of agglutinate rosette-hairs exposed in older leaves as a smooth scintillating surface where the upper stratum has fallen off, upper detersile stratum forming complete surface in younger leaves in patches only on older consisting of funnel-shaped cup-hairs broad and open the mouth easily seen usually but where crowded together becoming more narrow funnels, each with a short stalk and a delicate thin wall of small cells elongated in the direction of the axis of the cup, the margin of the cup prolonged into a fringe of short hair-branches which interlace with those of adjacent cups; when uncompressed and complete the surface appears foveolate; petiole stout flat or convex not grooved above about 2.5 cm. long showing traces of the same

glabra (costa media pilorum juvenilium vestigiis induta excepta), costa media anguste sulcata basim versus elevata, venis primariis utrinsecus circ. 15; subtus indumento bistrato grisea costa media et venis primariis elevatis rubrotinctis percursa; indumenti stratum superum detersile e pilis cupulari-infundibuliformibus stipitatis et ad os ramulis radiantibus cinctis aedificatum, stratum inferum persistens pilorum rosulatorum agglutinatorum pelliculam faciens; petiolus crassus circ. 2.5 cm. longus supra planus vel leviter convexus ut ramuli indumento plus minusve vestitus. Flores in racemo-umbellam circ. 12-floram dispositi, rhachi puberula; bracteae intimae oblongae acutae ad 4 cm. longae extus intusque sericeae; bracteolae vix 1 cm. longae lineari-clavatae pilosae pilo-cristatae; pedicelli dense tomentosi 3–4 cm. longi. Calyx parvus circ. 2 mm. longus patelliformis minute dentatus dense tomentosus. **Corolla flavido-alba varo atropurpureo** basali notata circ. 3.5 cm. longa campanulata paullo obliqua carnosula 9-loba; lobi rotundati emarginati imbricati circ. 1 cm. longi 1.5 cm. lati. Stamina 18 inaequalia corolla dimidio breviora gynaeceo paullo breviora; filamenta puberula. Discus glaber. Gynaeceum circ. 2.5 cm. longum; ovarium conoideum sulcatum truncatum circ. 6 mm. longum 10-loculare pilis brevibus fasciatis dense tomentosum; stylus glaber sub stigmate lato discoideo lobulato expansus.

ash-grey indumentum as is seen on stems. Flowers in a shortly racemose umbel of some 12 flowers, rhachis puberulous ; fertile bracts submembranous oblong acute densely silky on both sides as much as 4 cm. long ; bracteoles very short somewhat linear club-shaped hairy from the base and with a white hair-crest ; pedicels 3–4 cm. long densely tomentose inserted in middle of obliquely set-on calyx-base. Calyx saucer-shaped about 2 mm. long densely tomentose showing very short inconspicuous marginal teeth. Corolla cream-white with dark basal purple blotch about 3.5 cm. long campanulate slightly oblique fleshy (" glutinous," Ward) 9-lobed ; lobes rounded emarginate imbricate about 1 cm. long 1.5 cm. broad. Stamens 18 unequal short little more than half the length of the corolla and shorter than gynaeceum ; filaments puberulous. Disk glabrous. Gynaeceum about 2.5 cm. long shorter than corolla ; ovary conoid grooved truncate about 6 mm. long 10-chambered densely tomentose with short besom-like hairs ; style glabrous sometimes some hairs at its base expanded under the broad discoid lobulate stigma.

N.E. Upper Burma. Lashi country. Htawjaw, valley of Naum-Chaung. Gnarled tree of 20–30 ft. as above 10,000 ft. Flowers rather glutinous, cream-white with dark purple blotch at base of corolla. Kingdon Ward. No. **1565.** May 19, 1914.

We know this plant only in a single specimen of Ward's collection. It is one of the few species of the Falconeri series not yet in cultivation.

The region of N.E. Burma and the adjacent one of Western Yunnan have added several species to the Falconeri series of Rhododendron. We have *Rh. arizelum,* Balf. f. et Forrest, *Rh. basilicum,* Balf. f. et W. W. Sm., *Rh. megaphyllum,* Balf. f. et Forrest, and *Rh. preptum,* Balf. f. et Forrest. *Rh. regale* gives us another. In S.E. Yunnan the series appears in *Rh. sino-Falconeri,* Balf. f., and is represented in N.E. Yunnan in *Rh. Rex,* Lévl., whilst in the N.W. region of Yunnan we have *Rh. fictolacteum,* Balf. f., and *Rh. coriaceum,* Franch.—the latter extending into S.E. Tibet. W. Szechwan gives us one species in *Rh. galactinum,* Balf. f. In all then ten species of this large-leaved series of Rhododendron have been made known within recent years from W. China and adjoining areas, more than double the number of those on record from Eastern Himalaya, where Hooker discovered *Rh. Falconeri,* Hook. itself, and *Rh. Hodgsoni,* Hook. f., to which were added *Rh. eximium,* Nutt. and more recently *Rh. decipiens,* Lacaita, making the roll one of four species. Doubtless more members of the series will be discovered in course of further exploration in the wide area of the home of Rhododendrons, but as we have it now the Falconeri series is a remarkably illustrative example of the wealth in West

China and adjoining countries which recent exploration has brought to us. *Rh. coriaceum* was described in 1898; all the other Chinese forms have come to us during the past decade.

Rh. regale belongs to that set of the Falconeri series in which the underleaf indumentum is always grey—very different from the rusty red or red-cinnamon coloured indumentum that characterises the other species in the series and which is so familiar in the leaves of *Rh. Falconeri*. It shares this type of indumentum with *Rh. coriaceum*, *Rh. Hodgsoni*, and *Rh. Rex*—species it will be observed from widely separate areas—and the conspicuous feature of the indumentum in these forms is not only one of colour but also of the form of the cup-hairs which constitute its upper stratum. These are bowl-shaped (*i.e.* with rounded base) wider or narrower, or funnel-shaped (*i.e.* with pointed base) with wide mouth—the mouth fringed or not—and as they stand side by side upon the leaf surface the mouths of the cup-hairs appear as openings into cavities and the whole surface acquires a foveolate appearance. As the leaf oldens and the time for shedding of these cup-hairs which have thin walls approaches they collapse and look like deflated bladders scintillating on the surface of the grey persistent pellicle of under stratum of indumentum. This is most characteristic and enables one readily to separate the four species in which it occurs from other members of the Falconeri series where the upper stratum apart from colour is more or less woolly. In *Rh. Hodgsoni* only do these cup-hairs become somewhat adpressed to the pellicle beneath and form a somewhat agglutinate scurf. These four species of the Falconeri series so easily recognised by their grey scintillating indumentum may be distinguished thus :—

Cup-hairs of underleaf indumentum bowl-shaped not fringed. Corolla rose, spotted, about 3 cm. long. Stamens 14 puberulous. Ovary 7-chambered, its hairs floccose.	*coriaceum.*
Cup-hairs of underleaf indumentum bowl-shaped fringed. Corolla rose, spotted, above 4–5 cm. long. Stamens 16 puberulous. Ovary 9-chambered, its hairs floccose.	*Rex.*
Cup-hairs of underleaf indumentum funnel-shaped fringed. Corolla cream-white, blotched purple, about 3.5 cm. long. Stamens 18 puberulous. Ovary 10-chambered, its hairs fasciate.	*regale.*
Cup-hairs of underleaf indumentum open shallow cups hardly fringed often agglutinate. Corolla rose-purple, unspotted, about 3 cm. long. Stamens about 15 glabrous. Ovary 9–12-chambered, its hairs woolly.	*Hodgsoni.*

Rhododendron rubrolineatum, Balf. f. et Forrest.* (Trichocladum.)

Shrub about 1.5 m. high with virgate branches. Branchlets thin straight, those of the year finely puberulous and densely lepidote with yellow scales, those a year old about 2 mm. in diameter somewhat rufescent and slightly warted with rufous vestigial scales. Terminal foliage-buds ovoid about 1.2 cm. in diameter reddish-brown; scale-leaves of the foliage-buds all caducous; outermost scale-leaves small about 3 mm. long crustaceous rigid broadly triangular from a wide base keeled and apiculate or only acute outside lepidote, inside more or less silky with adpressed hairs; inner scale-leaves gradually oblong, innermost membranous yellowish browner in middle spathulate about 1.2 cm. long 5 mm. broad, outside towards top lepidote along mid-rib, inside along middle particularly towards top silky with adpressed hairs, margins ciliate with long undulate hairs, summit subtruncate or rounded with many short white marginal hairs; young leaves conduplicate-convolute in the bud, upper surface dark olive-green showing the reddish veins very sparsely lepidote, midrib villous to above middle, margin particularly towards apex with a few very long twisted hairs, under surface bright yellow-lepidote with contiguous scales; petioles of juvenile leaves grooved densely yellow-lepidote with a few long hairs and more or less villous in groove. Mature leaves shortly petiolate about 3.8 cm. long falling after one season; lamina leathery elliptic or oblong-elliptic as much as 3.5 cm. long and 2 cm. broad, apex obtuse or rounded with a short tuberculate hydathodal mucro, margin slightly cartilaginous and recurved obscurely crenulate with notches of fallen hairs, base more or less obtuse; upper surface slightly reticulate

* *Rhododendron rubrolineatum*, Balf. f. et Forrest.—Frutex virgatus ad 1.5 m. altus. Rami tenues stricti annotini puberuli dense lepidoti. Alabastrorum perulae caducae. Folia annua petiolata ad 3.8 cm. longa; lamina coriacea elliptica vel oblongo-elliptica ad 3.5 cm. longa 2 cm. lata apice obtuse mucronata, margine obscure crenulata eciliata, basi obtusa; supra subolivacea glabra (costa media excepta); subtus pallidior discontigue lepidota, costa media minute puberula; petiolus circ. 3 mm. longus lepidotus et puberulus. Flores in umbellas axillares ad apicem ramulorum fasciculatas dispositi; bracteae sub anthesi persistentes; bracteolae filiformes circ. 1 cm. longae pilosae et lepidotae; pedicelli circ. 1 cm. longi stricti plus minusve lepidoti. Calyx brevis circ. 1 mm. longus 5-lobatus; lobi rotundati vel subacuti extus lepidoti margine eciliati. Corolla flavida roseo-lineata postice maculata campanulata circ. 1.8 cm. longa 5-loba; tubus extus plus minusve lepidotus, intus leviter puberulus; lobi circ. 1.8 cm. longi 7 mm. lati oblongi apice rotundati subcrenulati. Stamina 10 corollam subaequantia; filamenta supra basim dense villosa. Discus puberulus. Gynaeceum corollam staminaque subaequans vel eis paullo longius; ovarium conoideum imbricatim lepidotum circ. 2 mm. longum; stylus glaber ovario longior. Capsula ovoidea ad 1 cm. longa, 5 mm. lata. Semina minuta fusiformia exannulata.

(dry) glabrous excepting the grooved midrib which is more or less hairy, primary veins about 8 on each side hardly visible ; under surface paler, puberulous midrib and primary veins whitish yellow raised very conspicuous, whole surface lepidote with short-stalked rufous or yellowish peltate small discontiguous scales some smaller some larger each scale having a broad umbo and narrow fringe and throughout infiltrated by reddish or yellow secretion, intervals between the scales greater than diameter of scales clad with conspicuous epidermal wax-coated papillae ; petiole about 3 mm. long grooved, the groove villous, elsewhere lepidote and at the base more or less puberulous. Flowers in 3-flowered (or 4) axillary umbels solitary in the axils of the uppermost foliage-leaves, 4 or more such umbels in a cluster, no terminal umbel ; bracts loosening and falling as flowers expand or remaining as a circlet enclosing base of flower-pedicels, all crustaceous, outermost rounded about 3 mm. in diameter, inner oblong or oblong-elliptic convolute obtuse or truncate lepidote outside white ciliate about 1 cm. long ; bracteoles filiform about 1 cm. long pilose from base hair-crested with a few lepidote scales outside ; pedicels about 1 cm. long stiff divergent more or less lepidote. Calyx small about 1 mm. long cut almost to base into 5 rounded or subacute lobes, outside more or less lepidote, margin eciliate or with an occasional hair. Corolla campanulate ivory-yellow lined and flushed rose outside, slightly spotted on posterior side, about 1.8 cm. long ; tube not grooved expanding into a spreading limb of 5 lobes, outside more or less lepidote, inside faintly puberulous ; lobes about 1 cm. long and 7 mm. broad oblong, rounded at apex, margin somewhat crenulate. Stamens 10 unequal about same length as or shorter than corolla, longest about 1.8 cm. long with oblong brown anther about 2 mm. long, shortest about 1 cm. long with globose anther about 1 mm. in diameter ; filaments stout slightly wider to base which is naked for about 2 mm. and then densely villous upwards to or short of the middle (higher in the shorter stamens). Disk puberulous below the ovary. Gynaeceum about equalling in length or slightly longer than corolla and stamens ; ovary conoid imbricately yellow-lepidote about 2 mm. long ; style glabrous slightly expanded at apex into a greenish slightly lobulate stigma. Capsule ovoid about 1 cm. long 5 mm. broad brown showing traces of the ovarian scales dehiscing from apex to base by 5 lobes. Seeds very small not 1 mm. long brown fusiform striate without an arillar wing, pointed at chalazal end, slightly protruding at funicular end.

Mid W. Yunnan. Tali Range. Open pasture. Alt. 11,000 ft. Shrub of 2 ft. Flowers creamy (ivory) yellow, lined and

flushed rose on exterior. Very rare! G. Forrest. [Without number.] May 1917.

E. N.W. Yunnan. Kari Pass. On the margins of pine forests. Alt. 12,000 ft. Lat. 28° N. Shrub of 3–5 ft. Flowers canary yellow. G. Forrest. No. **13,914.** June 1917.

Yunnan. Without precise locality. Duplicate in fruit. G. Forrest. No. **17,423.** Oct. 1918.

One of the Trichocladum series and allied to *Rh. melinanthum*, Balf. f. et Ward, from Ka-gwr-pw, from which its leaf-form distinguishes it.

4910 **Rhododendron sidereum,*** Balf. f.† (Grande.)

Tree as much as 9 m. high with stout branches 8 mm. in diameter when a year old, coated with a dirty grey thin agglutinate indumentum of greasy hairs scaling off on older branches. Foliage-bud large nose bullet-shaped and with many imbricating scale-leaves outside; the outermost scale-leaves (2 or 3) woody short with small rotundate base ending in a long acuminate tail four times or less the length of the base with a floccose tomentum, followed by rounded crustaceous ones gradually becoming oval or oval-oblong earlier ones mucronate later ones emarginate the back clad with very reddened floccose hairs and sticky from immersed glands; innermost scale-leaves petiolate more membranous as much as 4.5 cm. long, the lamina lanceolate acute ending in a long mucro densely tomentose with brown or reddish floccose greasy hairs; young leaves revolute densely tomentose on both surfaces and glandular on under surface. Leaves petiolate as much as 23 cm. long persistent for a couple of years; lamina leathery oblong-lanceolate often slightly curved as much as 21 cm. long 6 cm. broad, acute with a hydathodal apiculus

* *sidereus*, excellent—expressive of the qualities of the plant.

† *Rhododendron sidereum*, Balf. f.—Arbor ad 9 m. alta. Rami breves crassi indumento griseo agglutinato induti. Alabastra oblonga magna perulis plurimis imbricatis obtecta. Folia petiolata ad 23 cm. longa; lamina coriacea oblongo-lanceolata ad 21 cm. longa 6 cm. lata, acuta mucronata, margine paullo recurva, basi obtusa vel late cuneata; supra olivacea subnitens glabra vel in sulco costae mediae pilorum vestigiis notata; subtus argenteo-nitens costa media et venis primariis purpureis, indumento agglutinato persistente e pilis intricatim ramosis et glandulis ovoideis aedificato vestita; petiolus circ. 2 cm. longus agglutinato-tomentosus. Flores in racemo-umbellam plurifloram dispositi, rhachi longa floccosa; bracteae extimae crustaceae rotundatae glutinosae, intimae oblongo-spathulatae sericeae; bracteolae breves circ. 5 mm. longae; pedicelli circ. 2 cm. longi albo-tomentosi sub calyce obliqui. Calyx brevissimus. Corolla flavido-alba intus varo basali coccineo notata subcarnosula ad 4 cm. longa oblique campanulata glabra 8-lobata; lobi rotundati emarginati circ. 1 cm. longi. Stamina 16 subaequalia; filamenta tenuia puberula. Discus sparsim puberulus. Gynaeceum corolla paullo brevius staminibus longius; ovarium conoideum truncatum sulcatum circ. 7 mm. longum 12-loculare, dense albo-tomentosum eglandulosum; stylus crassus glaber; stigma discoideum recurvum.

ending in a red tubercle, margin cartilaginous slightly recurved, base usually unequal somewhat wedge-shaped or obtuse ; upper surface olive-green with darker purple-tinted midrib and primary veins smooth somewhat glossy quite glabrous or showing particularly in the groove of the midrib remains of juvenile floccose hairs as a greyish scurf, primary veins some 15 on each side red-tinted and slightly grooved ; under surface silvery shining traversed by the conspicuous raised dark red-tinted midrib and the pinnately spreading conspicuous raised primary veins, midrib and primary veins glabrescent showing only patchy grey vestiges of juvenile indumentum, silvery surface due to an agglutinate persistent indumentum of hairs and glands forming a pellicle some hairs long branched intricately interwoven the ultimate branches somewhat vesicular and often scintillating with a substratum of rosettes of many clustered radiating hairs intermixed with ovoid glands which show on the surface as very minute punctulations, the whole indumentum a typical one of the Grande series ; petiole stout about 2 cm. long grooved clad like the stem and glabrescent as it is. Inflorescence terminal forming a racemose cluster of 15 or more flowers, the rhachis as much as 4.7 cm. long floccose with distant short flocks ; outer bracts brown crustaceous rounded with thinner margin glutinous, inner bracts oblong-spathulate rounded or truncate mucronate densely silky outside and on midrib towards top inside, about 3 mm. long 1 cm. broad ; bracteoles very short about 5 mm. long tapered from the base silky ; pedicels 2–2.5 cm. long stout expanding at top into an oblique disk white with a dense close woolly persistent indumentum. Calyx inconspicuous very minute deltoid teeth around oblique disk-like end of pedicel whitely tomentose like the pedicels. Corolla creamy white with crimson basal spots at base of posterior petals somewhat fleshy as much as 4 cm. long obliquely campanulate at the base slightly gibbous retuse glabrous 8-lobed ; lobes shallow rounded emarginate about 1 cm. long 1.5 cm. broad. Stamens 16 subequal about half length of corolla, anthers clustering about middle of tube ; filaments delicate towards base puberulous with long thin pointed striate hairs ; anthers 5 mm. long. Disk sparingly puberulous. Gynaeceum about 3.5 cm. long slightly shorter than corolla longer than stamens ; ovary conoid grooved truncate about 7 mm. long with 12 chambers, eglandular, densely whitely tomentose, the tomentum of long stalked fasciate hairs with long undulate and curling non-septate loose spreading branches ; style stout glabrous expanded below the large lobulate discoid recurving stigma.

N.E. frontier of Burma. Tamgam. Capt. Abbay. No. 5. In Herb. Lace.

N.E. Upper Burma. Western flank of the N'Maikha-Salween divide. Lat. 26° N. Alt. 10,000 ft. In thickets and forests. Shrub 8–10 feet. Flowers yellow. In old fruit. G. Forrest. No. **17,860.** April 1919.

N.E. Upper Burmah. N'Maikha-Salween divide, western flank. Lat. 26° 15′ N. Alt. 9000–10,000 ft. In mixed forests. Flowers clear yellow with a crimson blotch at base. G. Forrest. No. **18,054.** May 1919.

N.E. Upper Burma. Hpimaw Hill. Alt. 9000–10,500 ft. A prevailing Rhododendron in the upper forest zone. A tree of 20–30 feet just coming into bloom. Reverse of leaves as it were lacquered silver on copper, that dimly sheens through. Flower-head elevated on conspicuous rhachis. Flowers creamy white. Stamens 16. A fine thing. Farrer. No. **872.** April 28, 1919.

N.E. Upper Burma. Ridge above Laktang (Kangfang route). Alt. 9000–10,000 ft. Bushy tree of 20 ft. growing on open grassy south-facing slope. Flowers pale creamy yellow, with a small deep purple blotch at base of corolla, nearly regular. Leaves silver beneath. Only one tree seen. F. Kingdon Ward. No. **3061.** May 25, 1919.

May 28. Many trees seen between 8000 and 9000 ft. from the beginning of the shrub belt up but they seem to bear very few flowers. Perhaps they do better on N.-facing slopes.—F. K. W.

A beautiful species of the Grande series. The first record of the plant is in Capt. Abbay's specimens which at first were supposed to be *Rh. grande*, Wight, and then were referred to *Rh. arboreum*, Sm. Abbay's specimens have imperfect flowers only. Now we have it in good state from each of the three explorers, Farrer, Forrest, Ward, who have been collecting in N.E. Burma and W. Yunnan within a few miles of each other during last year. The plant comes in the series near the Himalayan *Rh. argenteum*, Hook. f., and *Rh. grande*, Wight, but it wants the glandular ovary of these species.

4911 **Rhododendron tapeinum,*** Balf. f. et Farrer.† (Sulfureum.)

Shrublet sometimes epiphytic forming an almost prostrate cushion with straight branchlets reddish-brown of short annual

* *ταπεινός*, lowly—in allusion to its habit.

† *Rhododendron tapeinum*, Balf. f. et Farrer.—Suffrutex prostratus pulvinatus nunc epiphyticus. Rami stricti dense setulosi et sparsim lepidoti perulis persistentibus plus minusve vestiti. Folia petiolata ad 2.8 cm. longa; lamina coriacea elliptica vel subovalis ad 2.5 cm. longa 1.5 cm. lata apice rotundata mucronata nunc retusa, margine cartilaginea recurva setulosa, basi obtusa nunc paullo decurrens; supra pallide viridis nitens laevis glabra (costa media sulcata basi excepta); subtus grisea papillis ceriferis baculiformibus dense vestita et squamulis aurantiacis in foveis depressis discontigue lepidota; petiolus

growths about 2 cm. long. Branches a year old densely bristly and with a few peltate gland-like scales about 1.5 mm. in diameter girt at the base by the persistent outer scale-leaves of the foliage-bud, older twigs becoming blackish grey and decorticating in third or fourth year, the outer foliage-bud-scales persisting for several years. Foliage-buds fusiform ; outer scales crustaceous brown ovate or rounded, the intermediate oblong keeled and mucronate, inner more membranous spathulate acute, all finely ciliate with occasionally some dorsal scales. Leaves petiolate as much as 2.8 cm. long usually less persistent for two or more years ; lamina leathery elliptic or somewhat oval as much as 2.5 cm. long 1.5 cm. broad, apex rounded sometimes retuse with a tuberculate mucro, margin cartilaginous revolute bristly but the bristles often falling each leaving a notch on the margin, base obtuse or sometimes slightly rounded and decurrent ; upper surface pale green glossy smooth glabrous except at base of grooved midrib where bristly, primary veins concealed ; under surface whitish grey clad with rod-shaped close-set epidermal wax-bearing papillae and lepidote with sunk scintillating orange-coloured discoid scales without a fringe some larger some smaller distance between the scales greater than diameter of scales some 6–7 scales in a square millimetre, midrib pink-tinted raised lepidote at base bristly, primary veins concealed ; petiole pink-tinted about 3 mm. long grooved bristly and lepidote underneath, bristly above. Flowers solitary terminal ; inner bracts grasping the pedicel until fruit is formed crustaceous oblong whitely ciliate ; pedicel barely 1 cm. long not swollen below the calyx, densely bristly and with a few stalked discoid white scales intermixed. Calyx large foliaceous yellow but darker at base about 7 mm. long cut to near base into 5 subequal lobes the posterior pair a little larger ; cup at the base bristly and lepidote ; lobes with fan-spreading veins glabrous on back, bristly and slightly crenulate at top. Corolla fleshy clear pale lemon-yellow evidently spotted posteriorly, open cup-shaped-campanulate about 2 cm. long lepidote outside with unequal glistening scales, glabrous inside ; tube short circular in outline expanding into a broad 5-lobed limb ; lobes broad imbricate crenulate

roseo-tinctus subtus setulosus et lepidotus, supra setulosus. Flores terminales solitarii ; pedicelli circ. 1 cm. longi stricti erecti dense setulosi et sparsim lepidoti bracteis intimis amplexicaulibus cincti. Calyx foliaceus flavidus circ. 7 mm. longus 5-fissus ; cupula setulosa et lepidota ; lobi extus glabri ad apicem longe setulosi. Corolla carnosula pallide lutea aperte cupulari-campanulata circ. 2 cm. longa extus squamulis scintillantibus lepidota, intus glabra, 5-loba ; lobi lati rotundati. Stamina 10 inaequalia corolla breviora ; filamenta supra basim glabram puberula. Discus glaber. Gynaeceum staminibus longioribus brevius circ. 1.3 cm. longum ; ovarium circ. 3 mm. longum petasiforme sulcatum truncatum squamulis albidis carnosulis dense lepidotum ; stylus glaber validus sub **stigmate angusto vix expansus.**

about 1 cm. long 1.5 cm. broad. Stamens 10 unequal shorter than corolla, longest about 1.5 cm. long with anther 4 mm. long, shortest about 1 cm. long with anther 3 mm. ; filaments stout widened to base glabrous there over about 2 mm. then puberulous to near base of corolla-lobes ; anthers orange-red. Disk orange-red glabrous. Gynaeceum about 1.3 cm. long shorter than longest stamens ; ovary dome-shaped 3 mm. long grooved truncate densely lepidote with white mushroom-like discoid scales ; style stout slightly decurved orange-coloured glabrous at top not swollen below the stigma which is narrower than style.

N.E. Upper Burma. Chimili cliffs. Alt. 12,000–13,000 ft. A low almost prostrate cushion in the high alpine granitic precipices opposite the Chimili Pass. Flowers clear yellow, but of no particular charm. Farrer. No. **938.** Just coming into bloom May 18, 1919.

N.E. Upper Burma. A western buttress of Imaw Bum. Alt. 10,000 ft. A beautiful dwarf. Epiphytic on an old fir-tree where it formed a compact cushion high up. Flowers pale lemon-yellow with orange-red stamens. Leaves silver-green underneath. Kingdon Ward. No. **3095.** May 27, 1919. See No. **3196.** Also *cf.* No. **37.**

N.E. Upper Burma. Valley of the Chaung-maw-Lka. Alt. 8000 ft. Dwarf shrub forming a sort of heath on a large mossy boulder in the river bed. Other rhododendrons, a fir-tree, etc., growing on the same boulder. Kingdon Ward. No. **3196.** June 6, 1919. Same as No. 3095.

A representative in N.E. Upper Burma of the Mekong-Yangtze species *Rh. megeratum,* Balf. f. et Forrest (see p. 140). They are microforms of one type. This southern form has altogether a dwarfer habit as it is described and at times is epiphytic and has elliptic smaller leaves. The most conspicuous difference is seen in the calyx the lobes of which glabrous in *Rh. megeratum* are crowned by long bristles in *Rh. tapeinum.* In the dried specimens this Burmese plant is hardly so attractive as is the northern species in Forrest's specimens, yet I should expect it to be quite a delightful plant for the rock garden and to this Kingdon Ward's comment, " a beautiful dwarf," may be cited in support. To Mr. Farrer, however, the flowers did not appeal as of any " particular charm."

3880

Rhododendron timeteum,* Balf. f. et Forrest.†

A shrub barely 2 m. high at most with short yearly growths which interlace and evidently form a compact bush. Twigs of

* τιμητέος, to be honoured—in allusion to its value as a garden plant.

† *Rhododendron timeteum,* Balf. f. et Forrest.—Frutex fere ad 2 m. altus ramulis glabris ; annotini circ. 2 mm. diam. Folia petiolata ad 7 cm. longa ;

the year red, the surface cells unequally impregnated with red secretion giving a finely blotched smooth surface epilose and elepidote (but for perhaps an occasional scale), twigs a year old about 2 mm. in diameter becoming grey smooth glabrous, decorticating usually in the third year. Buds large fusiform few at the ends of the shoots and below the terminal inflorescence; outermost scales crustaceous rounded or broadly ovate sparingly lepidote on back and ciliate, inner ones oblong-ovate densely lepidote and ciliate, innermost membranous spathulate obtuse mucronate greenish with fan-shaped venation lepidote outside and hair-ciliate particularly at top carried up on elongating axis; young leaves conduplicate-convolute becoming revolute as they expand their upper surface glabrous, under surface lepidote, altogether epilose. Leaves petiolate as much as 7 cm. long; lamina thinly leathery oval or elliptic or oblong-oval as much as 6 cm. long 3 cm. broad, apex rounded or obtuse the midrib ending in a tuberculate hydathode not stalked and often deflexed, margin cartilaginous smooth, base rounded or broadly obtuse; upper surface bright green mat smooth glabrous, midrib and primary veins (about 8 on each side of midrib) slightly red-tinted and slightly raised; under surface paler green with a yellowish white glabrous midrib and the rest of venation appearing as a fine sunk reticulation, surface lepidote with brown equal uniformly distributed discontiguous peltate scales each with stalk sunk in shallow pit and a disk with broad concave umbo bounded by an orange-coloured annulus and a whitish-grey narrow fringe, green intervals between the scales wider than the scales which are about 3–4 in a sq. mm.; petiole as much as 1.2 cm. long red-tinted and blotched grooved epilose elepidote or most sparingly lepidote. Umbels solitary terminal usually 4-flowered; bracts early deciduous, unknown; bracteoles linear expanding spathulately at top shortly puberulous throughout at top lepidote on back with a conspicuous white hair-crest about 1.5 cm. long;

lamina tenuiter coriacea ovalis vel elliptica vel oblongo-ovalis ad 6 cm. longa 3 cm. lata, apice rotundata vel obtusa, margine cartilaginea vix revoluta integra nuda, basi rotundata vel late obtusa; supra pallide viridis glabra; subtus epilosa lepidota squamulis discontiguis, intervallis pallide viridibus; petiolus rubrotinctus ultra 1 cm. longus glaber vel sparsim lepidotus. Umbella plerumque 4-flora; bracteolae lineares apice spathulatae circ. 1.5 cm. longae pilo-cristatae; pedicelli validi 1–2 cm. longi glabri vel sparsissime lepidoti. Calyx parvus circ. 1.5 mm. longus 5-lobus; lobi rotundati extus lepidoti sparsim ciliati. Corolla purpureo-rosea postice coccineo-maculata zygomorpha circa 3.5 cm. longa extus elepidota et epilosa intus puberula; tubus a basi infundibuliformis in limbum latum patentem 5-lobum expansus; lobi lati fere rotundati circ. 2 cm. longi et 2 cm. lati. Stamina 10 inaequalia corollam subaequantia; filamenta deorsum dilatata puberula. Discus sparsim puberulus. Gynaeceum corollam et stamina subaequans; ovarium conoideum circ. 6 mm. longum truncatum sulcatum dense lepidotum; stylus basi paullo puberulus sub stigmate discoideo lobulato in labium angustum expansus.

pedicels stout red often unequal in same truss 1–2 cm. long glabrous but for an occasional peltate scale. Calyx small about 1.5 mm. long, the cup glabrous the 5 short (about .5 mm. long) rounded lobes lepidote outside and with a few marginal cilia. Corolla lavender or purplish-rose with deep crimson markings posteriorly, butterfly-shaped about 3.5 cm. long elepidote epilose outside, puberulous inside ; tube short wide funnel-shaped from base expanding into a broad open 5-lobed limb hardly grooved inside or ridged outside ; lobes of the limb large nearly rotundate subequal as much as 2 cm. long and 2 cm. broad faintly emarginate. Stamens 10 unequal longest about as long as corolla and gynaeceum with anther about 3 mm. long, shortest about 2 cm. long with anther about 2 mm. long ; filaments dilated downwards puberulous above the glabrous base to above mouth of corolla-tube. Disk nearly glabrous. Gynaeceum about as long as corolla and longest stamens ; ovary about 6 mm. long conoid truncate grooved densely lepidote ; style slightly puberulous at base only slightly expanded and forming a crimson narrow lip below the discoid lobulate stigma. Capsule 1.5 cm. long dehiscing to the base by 5 valves.

S.W. Szechwan. Mu-li Mountains, valley of the Litang. Lat. 28° 12′ N. Alt. 11,000 ft. In and on the margins of pine forests. Shrub of 3–4 ft. Flowers purplish-rose with a few dark markings. G. Forrest. No. **16,285.** June 1918.

S.W. Szechwan. Mountains around Mu-li. Lat. 28° 12′ N. Alt. 11,000 ft. Margins and openings of pine forests. Shrub of 4–6 ft. Flowers pale lavender-rose with deep crimson markings. G. Forrest. No. **16,291.** June 1918.

Szechwan rather than Yunnan is the home of the Triflorum series, and this species comes from the extreme S.W. region of Szechwan bordering on Yunnan. It is quite distinct from all of the Yunnan members of the series and from all of the described species from Szechwan, but recalls a plant which is in cultivation sent out by Veitch under the name "*Rh. coombense.*" There is no resemblance in this plant to the *Rh. coombense*, Hemsl., described and figured in the Botanical Magazine (1909), t. 8280.

With *Rh. oreotrephes*, W. W. Sm., *Rh. timeteum* has alliance, but I see no trace of the wax-covering which is so distinctive a mark of *Rh. oreotrephes* as well as of *Rh. triflorum*, Hook. f., two species which are near relations within the Triflorum series, the latter a yellow-flowered Himalayan, the former a purple-flowered Chinese one. From *Rh. oreotrephes* the new species *Rh. timeteum* can be distinguished also by the scales of the underleaf indumentum which in *Rh. oreotrephes* are close-set

stand up like beads upon and give a brown colour to the mature surface but in *Rh. timeteum* are distant leaving wide green areas between.

4912 **Rhododendron trichomiscum,*** Balf. f. et Forrest.†

Shrub reaching nearly 1 m. high with many straight thin (about 2 mm. in diameter when a year old) nodular branches clad with many red bristle-hairs, annual growth short a little over 1 cm. long producing some 4–6 foliage-leaves rosette-fashion at the top which seem to last but one year, the outermost scale-leaves of the bud falling in the year of expansion occasionally remaining to the end of the season, never persisting to the second year; twigs of the year red soon becoming grey and showing bristles or their wart-scars until decortication. Foliage-buds fusiform pointed; outermost scale-leaves crustaceous with rounded base acuminate or tailed keeled slightly lanate at base and along the margin and on the tail or apiculus, becoming when dry somewhat glaucous on back with slightly recurved margins, followed by more oblong-obovate ones rounded or truncate emarginate and mucronate at top; young leaves revolute in bud. Leaves petiolate as much as 5.5 cm. long; lamina chartaceous narrowly oblong-obovate as much as 5 cm. long 1.5 cm. broad apex obtuse or rounded-obtuse with a very short tuberculate red hydathodal mucro, margin slightly cartilaginous plane or very slightly recurved minutely notched and punctulate with the red bases of fallen hairs or bristles, base narrowed and tapered into a wing on the petiole and there often bearing red bristles; upper surface dark olive-green mat shagreened glabrous, midrib broad grooved with an occasional red bristle and traces of some floccose hairs, primary veins about

* **θρίξ, hair; μίσχος, stem—in allusion to the bristly twigs.**

† *Rhododendron trichomiscum,* Balf. f. et Forrest.—Frutex nanus ad 1 m. altus. Rami setiferi plus minusve nodulosi folia 4–6 rosulatim ad apicem gerentes. Alabastrorum perulae mox deciduae. Folia petiolata ad 5.5 cm. longa; lamina chartacea anguste oblongo-obovata ad 5 cm. longa 1.5 cm. lata, obtusa mucronata, margine subplana minute crenulata, basi in petiolum decurrens; supra olivacea in modum squali corii rugulosa glabra (costa media sparsim setifera et floccosa excepta); subtus flavido-viridis vestigiis pilorum floccosorum sparsim vestita, costa media elevata basi setifera; petiolus circ. 5 mm. longus dense setiferus. Umbella 4–6-flora; bracteae extimae caudatae, intimae oblongae sericeae; bracteolae pedicellis breviores; pedicelli circ. 1.5 cm. longi dense glanduloso-setosi. Calyx parvus circ. 2 mm. longus 5-lobus; lobi subaequales persistentes rotundati extus glabri margine setuloso-ciliati. Corolla pallide rosea emaculata circ. 3.3 cm. longa ubique glabra; tubus basi subcarnosulus intus vix costatus; lobi 5 rotundati 1.3 cm. longi 2 cm. lati emarginati. Stamina 10 paullo inaequalia corolla gynaeceoque breviora; filamenta glabra. Discus glaber. Gynaeceum corolla multo brevius staminibus paullo longius; ovarium petasiforme truncatum sulcatum circ. 3 mm. longum dense glanduloso-setosum et floccis paucis fasciatis indutum; stylus glaber.

6–8 on each side very slightly grooved; under surface paler a yellow-green with raised red-tinted midrib clad like the midrib on upper side, general surface shagreened the ultimate veinlets showing as a red impressed network sprinkled with flocks of whitish much-branched adpressed hairs; petiole red-tinted broad about 5 mm. long grooved bristly. Umbel small terminal of 2–4 flowers; flower-bud globose relatively large; outer bracts leathery rounded with a tail as long as the base dark red-brown 1 cm. long or a little more keeled and puberulous outside shortly ciliate, inner bracts oblong densely silky about 1.5 cm. long 7 mm. or more broad cucullate; bracteoles short about 8 mm. long thread-like pilose throughout and white hair-crested; pedicels stout about 1.5 cm. long densely clad with bristle-like red glands densely so at the swollen tip where are also a few fasciate flock-hairs. Calyx persistent small somewhat fleshy about 2 mm. long glabrous outside divided about half way into 5 subequal rounded broad lobes with long marginal bristle-glands. Corolla tubular-campanulate pale rose-pink without markings about 3.3 cm. long glabrous outside and inside; tube slightly thicker at base and retuse with faint inside interpetaline ridges 5-lobed; lobes broad rounded about 1.3 cm. long 2 cm. broad emarginate slightly crenulate. Stamens 10 slightly unequal much shorter than corolla and slightly shorter than gynaeceum, longest stamen about 2.3 cm. long shortest about 1.8 cm. long; filaments slightly dilated downwards glabrous, anthers about 2 mm. long. Disk glabrous. Gynaeceum about 2.5 cm. long shorter than corolla; ovary about 3 mm. long dome-shaped deeply grooved truncate densely clad with bristle-glands and short glands and a few fasciate flock-hairs; style stout glabrous swollen below the broad discoid lobulate stigma.

S.E. Tibet. Tsarong. On Ka-gwr-pw, Mekong-Salween divide. Alt. 14,000 ft. Lat. 28° 14′ N. In cane brakes and rhododendron thickets. Shrub of 2–3 ft. Flowers pale rose-pink without markings. G. Forrest. No. **16,826.** July 1918.

Rh. trichomiscum is one of a group of beautiful moorland Rhododendrons discovered by Forrest in the Tsarong district of S.E. Tibet on the slopes of Ka-gwr-pw and Doker-la. The other members of the group are *Rh. eudoxum*, Balf. f. et Forrest,* *Rh. temenium*, Balf. f. et Forrest,† and *Rh. pothinum*, Balf. f. et Forrest (see p. 147 of this story). They are forms which occupy a position amongst Rhododendrons between those which we can assemble around *Rh. sanguineum*, Franch. in a Sanguineum series and those which aggregate about *Rh. neriiflorum*, Franch. in a series which has not yet been sufficiently

* Notes R.B.G. Edin., xi (1919), 60. † Ibid., 146.

studied for prescription of limitation. When describing *Rh. eudoxum* I placed it as an aberrant form of the Sanguineum series. When describing *Rh. temenium* I emphasised its relationship to *Rh. neriiflorum*. In *Rh. pothinum* and *Rh. trichomiscum* we have now two new forms which add to our data for framing phyletic lines, but I am not to discuss them in detail here. There is still a mass of related material of Forrest's collecting that requires analysis before sound deductions are possible. I will only say that these new species are closely allied to the forms already known and show the same character intermediate to *Rh. sanguineum* on the one side and *Rh. neriiflorum* on the other. The prominent character of relation—one which appears at sight—is that of the underleaf indumentum which in *Rh. eudoxum* is a thin white veil of interwoven floccose hairs—only requiring thickening to represent fairly well a typical Sanguineum series indumentum—which is more or less detersile and in *Rh. pothinum* is absent altogether from the first and so we are taken to *Rh. neriiflorum*.* Additional material which has reached us from Forrest since the date of my previous writing on this subject enables me to establish as a character possessed by all of the four species here mentioned the development of bristles on the young stems, leaf-petioles, and even on the lamina-bases. These bristles sometimes disappear early and this explains omission of mention of them in the description of *Rh. eudoxum*. In that species as in the others they occur. In a key which I framed of diagnostic marks between some of the members of the Sanguineum series,† *Rh. eudoxum* is included and occupies an isolated position, and to shorten my writing the following extension of that portion of the key which refers to *Rh. eudoxum* will suffice to bring out the relation between it and its three allies of which we have been speaking, and with which it forms without question a subsidiary phylum between that of *Rh. sanguineum* and that of *Rh. neriiflorum* :—

Underleaf surface grey-green, glabrous.
  Scale-leaves of the bud falling at expansion.
    Stems, petioles and midrib in part red-setulose eglandular.
      Pedicels and ovaries densely fasciate-floccose eglandular.
        Calyx 3 mm. long; cup and lobes glabrous on back; lobes deep red floccose-ciliate persistent.
          Corolla campanulate dark rose unspotted.
            Staminal filaments glabrous.
              Style shorter than corolla . . . *pothinum.*

* See Notes R.B.G. Edin., xi (1919), pp. 76, 123.

† Ibid., 80.

Underleaf surface yellow-green sparingly floccose or glabrescent.
Scale-leaves of bud falling at expansion.
Stems and petioles red-setulose with floccose substratum.
Pedicels and ovaries with setulose-fasciate and floccose substratum; ovaries floccose shortly glandular.
Calyx 1 cm. long; cup and lobes glabrous on back; lobes dark red floccose-ciliate persistent.
Corolla tubular-campanulate deep crimson unspotted.
Staminal filaments glabrous.
Style longer than corolla . . . *temenium.*

Underleaf surface yellow-green sparingly floccose.
Scale-leaves of the bud falling at expansion.
Stems, petioles and midrib in part red-setulose eglandular.
Pedicels and ovaries fasciate-floccose setulose glandular.
Calyx 2 mm. long; cup and lobes glabrous on back; lobes pale-coloured floccose-ciliate persistent.
Corolla tubular-campanulate pale rose-pink unspotted.
Staminal filaments glabrous.
Style shorter than corolla . . . *trichomiscum.*

Underleaf surface yellow-green with a thin veil of floccose hairs.
Scale-leaves of the bud falling at expansion.
Stem, petioles and midrib red-setulose and shortly glandular often glabrescent.
Pedicels and ovaries shortly glandular.
Calyx 7 mm. long; cup floccose and glandular on back; lobes red glabrous on back, floccose and gland-ciliate deciduous.
Corolla tubular-campanulate dark rose sparingly spotted.
Staminal filaments puberulous.
Style equalling in length corolla . *eudoxum.*

Amongst the typical members of the Sanguineum series *Rh. trichomiscum* finds a resembling form in *Rh. cloiophorum*, Balf. f. et Forrest. In form and tint of foliage they are much alike and that *Rh. cloiophorum* within its phylum does not retain the scale-leaves of its foliage-buds so markedly as is seen elsewhere finds an echo in *Rh. trichomiscum* where the scale-leaves sometimes persist to the end of the season of formation. The flower-colour in the living plants is the same—rose according to Forrest's description—and in both when dried the flowers fade to a yellowish tint so evident that without the regulating statement

of the man on the spot a describer of the dried specimens would not be blameable had he given yellow as the flower-colour. There is no risk of confusion of the two species if the underleaf indumentum be looked at, *Rh. cloiophorum* having the typical white to buff-coloured bistrate indumentum of the Sanguineum series, and it has no bristle-hairs on the stem.

4413 **Rhododendron trichophorum,** Balf. f.* (Triflorum.)

Loosely branched shrub forming a few longer erect virgate branches. Branches of the year bright green scaly with yellowish scattered scales conspicuous beneath many white bristle-hairs; branches a year old about 3.5 mm. in diameter becoming brown the scales as blackish warts and the bristles blackening and persisting for many years. Foliage-bud oblong-ovoid pointed; outermost scale-leaves crustaceous rounded or broadly triangular keeled and mucronulate more or less ciliate; inner oblong or ovate; innermost thinner strap-shaped spathulate hooded blunt or rounded shortly mucronulate about 1.5 cm. long 5 mm. broad at the top; all more or less silky inside, scaly with yellowish peltate scales outside, more or less ciliate; young leaves conduplicate-convolute ciliate, both surfaces scaly, the upper also puberulous and bearing bristles with the midrib slightly depressed and puberulous, the under surface densely hairy on midrib. Leaves petiolate as much as 9.5 cm. long; lamina thinly leathery ovate or oblong-ovate as much as 9 cm. long 3.5 cm. broad narrowed to an acute tip with a prominent red hydathodal mucro, margin cartilaginous slightly recurved, base cordulate or subtruncate; upper surface opaque dark green, when young usually red the red tint often remaining on the leaves in their second year, slightly shagreened distantly black spotted with remains of juvenile peltate scales also most minutely puberulous, the

* *Rhododendron trichophorum,* Balf. f. — Frutex laxe ramosus nunc ramos virgatos emittens. Rami hornotini laete virides lepidoti et pallide setosi, annotini 3.5 mm. diam. brunnei squamis et setis nigricantibus. Alabastra oblonga acuta; perulae intimae ligulatae circ. 1.5 cm. longae 5 mm. latae intus sericeae, extus lepidotae, ciliatae; folia juvenilia conduplicata-convoluta. Folia petiolata ad 9.5 cm. longa; lamina tenuiter coriacea ovata vel oblongo-ovata ad 3.5 cm. lata, apice acuta, margine leviter recurvata, basi cordulata vel trunculata; supra opaca viridis vel erubescens squamis nigris peltatis distantibus obscure conspersa minutissime puberula, costa media puberula; subtus pallidior squamis luteis inter se ad 1 mm. distantibus, costa media prominula puberula sparsim setulosa; petiolus puberulus et dense setosus circ. 5 mm. longus. Umbella 4-flora; bracteolae filiformes pedicellis breviores; pedicelli virides lepidoti et setosi circ. 2 cm. longi. Calyx circ. 1.5 mm. longus lepidotus et ciliatus. Corolla zygomorpha plus minusve infundibuliformis violacea postice albida et viridi-maculata 5-loba, ad 4 cm. longa extus epilosa; tubus albido-roseus intus puberulus. Stamina 10 inaequalia corollam subaequantia; filamenta supra basim villosa. Discus puberulus. Gynaeceum corolla longius; ovarium lepidotum pilo-cristatum; stylus basi pilosus; stigma kermesinum parvum.

midrib slightly grooved with a puberulous ridge in the groove, primary veins some 9 on each side pinnately radiating ; under surface paler scaly with yellowish peltate scales about 1 mm. apart each with a broad umbo and narrow fringe, hairless except on the prominent midrib which is puberulous and bristly, primary veins slightly prominent ; petiole short and broad about 5 mm. long puberulous and densely bristly also with a few peltate scales, slightly grooved above. Flowers in terminal usually 4-flowered umbels ; bracts falling as flowers expand ; bracteoles filiform with spathulate apex about 1.5 cm. long shorter than pedicels, hairy on back and scaly on underside of broader tip ; pedicels green about 2 cm. long scaly and bristly with white bristles. Calyx small cup-shaped or saucer-shaped about 1.5 mm. long green scaly and hairy outside the 5 lobes rounded or pointed longer than the cup with long marginal white cilia. Corolla of butterfly-form with funnel-shaped laterally compressed tube which is pinkish passing into white at base of posterior petal, the limb rich violet (hortense-violet) with a white area on posterior petal and many green spots, as much as 4 cm. long ; tube fleshy deeply grooved outside at base specially on each side of posterior petal correspondingly ridged inside, more or less pouched the posterior petal much more so than the others, inside puberulous in the throat, expanding obliquely into 5-lobed limb ; lobes ovate or oblong-ovate obtuse posterior erect broadest as much as 2 cm. long 1.8 cm. broad entire. Stamens 10 unequal, longest about equalling corolla some 4 cm. long with anther 3.5 mm. long, shortest about 2 cm. long with anther 2 mm. long ; filaments flushed pink slightly dilated downwards, base naked over about 3 mm. then with a tuft of villous hairs, hairless above ; anthers ochre-coloured. Disk puberulous below the ovary. Gynaeceum about 4.5 cm. long a little longer than corolla ; ovary about 4 mm. long conoid truncate densely scaly hair-crested ; style pink hairy at base slightly swollen and forming a narrow crimson lip below the discoid lobed crimson stigma.

Szechwan. Muping. Wilson. No. **4242.**

Rh. trichophorum has appeared in several individuals along with true *Rh. villosum*, Hemsl. et Wils., in a sowing of Wilson's No. 4242. That number is cited in Plantae Wilsonianae for *Rh. villosum* from Muping and *Rh. trichophorum* may be taken therefore to be a Muping plant. It is not *Rh. villosum*. The two plants are very different in appearance and can be readily separated by technical characters. The old leaves are hairless on the upper surface not covered with bristles as in *Rh. villosum* and not puberulous beyond the midrib below as the leaves are in *Rh. villosum* ; the calyx is ciliate with bristle-hairs but not villous with them all over ; the corolla has a pink tube passing

into white lepidote and hairless outside with a violet limb not a deep-red tube lepidote and hairy outside with purple limb; the style is hairy not glabrous at base. When *Rh. trichophorum* first showed amongst our plants of *Rh. villosum* it had the aspect of a form of *Rh. Augustinii*, Hemsl., and it resembles that species more than it does *Rh. villosum*. But *Rh. Augustinii* never has the copious bristles on the stem and leaves which characterise *Rh. trichophorum*, and in particular has the pedicels without bristles; the underleaf peltate scales of *Rh. Augustinii* are distant from one another by about the diameter of the scales, sometimes a little more but rarely more than half a millimetre apart, while in *Rh. trichophorum* they are about 1 mm. distant. There are other differences also.

Rh. Amesiae, Rehd. et Wils., is another Muping plant of this affinity. As described in Plantae Wilsonianae it shows conspicuous differences from *Rh. villosum* in the warted not bristly surface of the stem bristles being present only on the petioles and in the hairless outer surface of the corolla. A specimen under the type number Wilson 3444 in Kew Herbarium kindly lent to me by the Director of Kew corresponds with the description and there is growing at Kew a plant which I have seen (not in flower) which in vegetative characters is this *Rh. Amesiae*. But at Edinburgh we have a specimen in our herbarium under the type number Wilson 3444 which has the stems clad with bristles. The same has to be said of the pedicels. In other characters it matches well Rehder and Wilson's plant. It would appear therefore that Rehder and Wilson's species may have either warted or bristly stems and pedicels. The dried material at Kew and Edinburgh is scrappy and does not suffice for much critical comparison of the two forms. If *Rh. Amesiae* has sometimes bristles on the stem it is linked more nearly with *Rh. trichophorum* but is yet distinct from it. Two characters—one strong the other less so—may be given as distinctions. The under surface of the leaf is in Rehder and Wilson's words "densissime lepidota et ferruginea." The peltate scales which are of different sizes are not quite contiguous but always closer together than the diameter of the scales. In *Rh. trichophorum* the under surface of the leaf is pale green the peltate scales which are nearly uniform in size being distant usually as much as 1 mm. apart as they are in *Rh. villosum*. This gives a diagnostic mark recognisable at sight. The other character referred to is in the corolla which has the tube villosulous inside whilst in *Rh. trichophorum* there are only a few short hairs.

In *Rh. trichophorum* is added another to a small phylum within the Triflorum series marked by the presence of bristles more or less developed over the shoots and also on the pedicels.

The other members of the phylum are *Rh. Augustinii* (1889)—after which as the longest described species we may call it the Augustinii phylum—*Rh. villosum* (1910), *Rh. Amesiae* (1913), and *Rh. Vilmorinianum* (1919). These are in cultivation. Another species of the phylum, *Rh. chasmanthum*, Diels (1912), is not in cultivation.

4012 **Rhododendron vicarium,** Balf. f.* (Lapponicum.)

A much-branched shrub with erect twiggy branches. Branches a year old about 1 mm. in diameter scurfy with rusty peltate scales aggregated together. Foliage-buds ovoid enwrapped in few scale-leaves ; outermost scale-leaves crustaceous broad ovate about 1 mm. long rusty lepidote outside ciliate ; intermediate somewhat rounded silky inside ; innermost of parchment consistence pale yellow elliptic or oblong-oval boat-shaped about 4 mm. long rounded or obtuse at apex sparingly

* *Rhododendron vicarium,* Balf. f. — Frutex multiramosus ramis erectis virgatis. Ramuli annotini circ. 1 mm. diam. squamis peltatis rufis congestis squarrosi. Alabastra foliorum ovoidea perulis paucis involuta; perulae extimae crustaceae latae ovatae acutae circ. 1 mm. longae dorso rufo-lepidotae ciliatae, intermediae subrotundatae intus sericeae, intimae pergamentaceae flavidae ellipticae vel oblongo-ovales scaphoideae apice rotundatae vel obtusae dorso sparsim rufo-lepidotae ciliatae ad apicem squameo-fimbriatae circ. 4 mm. longae. Folia petiolata ad 1.1 cm. longa; lamina crasse coriacea oblongo-ovalis vel ovalis vel oblongo-ovata ad 9 mm. longa 3 mm. lata apice obtusa vel rotundata nunc mucronulata margine paullo recurvata basi late obtusa ; supra atroviridis opaca squamis peltatis contiguis arescentibus induta, squamarum umbone lato plerumque incolorato, instita aequilata translucente, costa media vix sulcata ; subtus fulvo-rufa squamis bicoloratis commixtis contiguis (sed saepe intervallo angusto nudo separatis) indumentum bistratum facientibus vestita, squamis nonnullis strati superi rufis ex umbone lato secretione pleno institaque nitente aequilata aedificatis, aliis strati inferi incoloratis, costa media paullo prominula ; petiolus ad 2 mm. longus similiter ac caulis lepidotus. Flores 1–2 ad apicem ramulorum fere sessiles ; bracteae paucae sub anthesi plus minusve persistentes, exteriores crustaceae rotundatae cucullatae carinatae mucronulatae dorso rufo-lepidotae margine tenuiores ciliatae, intimae membranaceae pallide brunneae oblongae vel obovato-oblongae circ. 6.5 mm. longae 3.5 mm. latae dorso lepidotae et puberulae lanato-ciliatae ; pedicelli vix 1 mm. longi dense lepidoti. Calyx minutissimus vix 0.5 mm. longus cupularis lobos 5 rotundatos vel dentiformes exhibens extus dense lepidotus ; lobi squameo-fimbriati. Corolla caeruleo-violacea circ. 1.3 cm. longa extus lepidota epilosa ; tubus campanulatus circ. 2.5 mm. longus fauce intus puberulus supra in limbum concavum 5-lobatum ampliatus ; lobi oblongi vel oblongo-ovales vel ovales ad 8 mm. longi 5 mm. lati obtusi undulati. Stamina 10 corolla breviora alternatim longiora et breviora, longiora circ. 9 mm. longa antheris circ. 1 mm. longis ; filamenta deorsum latiora supra basim nudam intra tubum corollinum villosa. Discus puberulus. Gynaeceum circ. 7 mm. longum corolla staminibusque brevius ; ovarium cylindricum angustum 2 mm. longum paullo sulcatum dense imbricatim flavescenti-lepidotum ; stylus purpureo-ruber glaber rectus sub stigmate lobulato atro-purpureo discoideo paullo ampliatus. Capsula erubescens squamarum vestigiis obtecta angusta oblonga circ. 4 mm. longa 1.75 mm. diam. valvis 5 ab apice ad basim dehiscens.

rusty lepidote outside ciliate, at the tip scale-fringed. Leaves petiolate as much as 1.1 cm. long; lamina thickly leathery oblong-oval or oval or oblong-ovate as much as 9 mm. long 3 mm. broad with an obtuse or rounded apex here and there mucronulate, the margin slightly recurved, broadly obtuse at base; upper surface dark green opaque clad with peltate contiguous drying-up scales each with a broad umbo usually uncoloured and an equally broad translucent fringe, midrib scarcely grooved; under surface tawny rust-coloured clothed with contiguous peltate scales but often with a narrow naked interval between forming a bistrate indumentum, some scales rust-coloured of an upper stratum with a broad umbo full of secretion and an equally broad scintillating fringe, others equally mixed of a lower stratum uncoloured, midrib slightly prominent; petiole as much as 2 mm. long lepidote like the stem. Flowers 1–2 at the apex of the shoots, nearly sessile; bracts few more or less persistent during flowering; outer ones crustaceous rounded hooded keeled mucronulate rusty-lepidote outside margin thinner ciliate; innermost membranous pale brown oblong or obovate-oblong about 6.5 mm. long 3.5 mm. broad lepidote and puberulous outside woolly-ciliate; pedicels barely 1 mm. long densely lepidote. Calyx most minute barely 0.5 mm. long cup-shaped 5-lobed; lobes rounded or tooth-like densely lepidote outside scale-fringed. Corolla blue-violet about 1.3 cm. long lepidote and epilose outside; tube campanulate about 2.5 mm. long puberulous in the throat expanding into a concave 5-lobed limb; lobes oblong or oblong-oval as much as 8 mm. long 5 mm. broad obtuse undulate. Stamens 10 shorter than corolla, alternately long and short, longer about 9 mm. long with anther 1 mm. long; filaments broadened downwards and villous within the tube of the corolla above their naked base. Disk puberulous. Gynaeceum about 7 mm. long shorter than corolla and stamens; ovary cylindric narrow 2 mm. long slightly sulcate densely imbricately yellowish-lepidote; style red-purple glabrous straight slightly expanded under the lobulate dark purple discoid stigma. Capsule reddened covered by the vestiges of peltate scales narrow oblong about 4 mm. long 1.75 mm. in diameter dehiscing by 5 valves from apex to base.

W. Szechwan. Tatsienlu. Fleurs bleu-violet. J. A. Soulié. No. **2772.** Juin 27, 1894. In Herb. Paris.

Rh. vicarium is not a Yunnan species. As a Tatsienlu plant it takes one for a comparison to the known forms from Szechwan. These are (with their discoverers' names) :—*alpicolum* (Wilson) and its var. *strictum* (Wilson), *blepharocalyx* (Soulié), *Edgarianum* (Wilson), *fastigiatum* (Wilson), *flavidum* (Soulié), *intricatum* (Soulié), *nitidulum* (Wilson) and its var. *nubigenum* (Wilson),

polifolium (Soulié), *psilostylum* (Wilson), *ramosissimum* (Wilson), *verruculosum* (Wilson), *Websterianum* (Wilson), *violaceum* (Wilson). Is the plant described here as *Rh. vicarium* not one of these? If not, how does it differ?

For future reference I will take those species successively in alphabetical order:—

Rh. alpicolum.—Is an intricately branched plant not virgate as is *Rh. vicarium.* Note, however, var. *strictum* is virgate. Is one of the punctulate Lapponicums and has scattered rufous scales over the underleaf surface of flavescent contiguous scales not the nearly equal distribution of rufous and paler scales sometimes hardly contiguous of *Rh. vicarium.* Its flowers are solitary but note in the var. *strictum* they are 2–3 in a truss. Its calyx has unequal oblong lobes 2 mm. long sparingly ciliate, in the var. *strictum* equal all ovate and 1.5 mm. long, very different from the hardly developed about 0.5 mm. long calyx of *Rh. vicarium* which is eciliate and scale-fringed. Its corolla is funnel-shaped, glabrous outside, with a tube 4 mm. long and lobes broadly ovate or obovate whilst in *Rh. vicarium* the tube is campanulate 2.5 mm. long lepidote outside and the lobes oval or oblong-oval. Its ovary is conic not narrow cylindric. Its style is pilose at base with a capitate stigma, glabrous however in var. *strictum*; in *Rh. vicarium* glabrous with a discoid stigma. Its capsule is ovoid not narrowed oblong. *Rh. vicarium* cannot be placed in *Rh. alpicolum.*

Rh. blepharocalyx.—Here we have a grey uniform shining tomentum, the corolla has a long tube and is elepidote, the stamens are 5, the style shorter than the ovary. Altogether a different plant.

Rh. Edgarianum.—So far as underleaf indumentum goes that of this species shows sometimes an approach to that of *Rh. vicarium* but is more commonly uniform. *Rh. Edgarianum* has nearly globose not ovoid foliage-buds. Its leaves are broadly ovate or broadly oval and always under 1 cm. in length, in *Rh. vicarium* they are oval or oblong-oval or oblong-ovate and reach 1.1 cm. long. Flowers are solitary not in pairs. Bracts are deciduous not persistent during flowering. Calyx is membranous purpling or yellow-green with 5 oval oblong obtuse or acutish lobes 2–2.5 mm. long and 1–1.5 mm. broad and ciliate, below the middle lepidote; very different from the minute lepidote and scale-fringed calyx about 0.5 mm. long of *Rh. vicarium.* Its corolla is funnel-shaped elepidote with a tube 5 mm. long and broadly ovate or obovate lobes not campanulate lepidote with a tube 2.5 mm. long. Its stamens 8 not 10. Its ovary conic with a style longer than the stamens and bearing a capitate stigma not cylindric with style shorter than stamens and bearing a

discoid stigma. Its capsule ovoid not narrow oblong. *Rh. vicarium* cannot be identified with *Rh. Edgarianum.*

Rh. fastigiatum.—I have not seen the plant from near Tatsienlu which Rehder and Wilson identify as *Rh. fastigiatum*, Franch., and am disposed to doubt the identification on the ground that Franchet's species in all the specimens of it which I have seen is a Yunnan plant only. One may have a clue to Wilson's plant in Rehder and Wilson's identification of Franchet's *Rh. capitatum* with it. That is a point I have not yet investigated. There is more than one species in the Paris Herbarium under the name *Rh. capitatum.* Even if *Rh. fastigiatum* be a Tatsienlu plant it is not *Rh. vicarium.* At a glance it can be separated by the discontiguous scales of its uniform underleaf indumentum so different from the bi-coloured state of *Rh. vicarium*, and then it has 3–5 flowered trusses not 1–2 and a large membranous calyx not a nearly obsolete one ; 10 long stamens longer than not shorter than corolla ; a long exserted style exceeding the stamens not included and shorter than the stamens ; an ovoid not narrow oblong capsule. *Rh. vicarium* is very different.

Rh. flavidum as a yellow-flowered species is readily separated from *Rh. vicarium.*

Rh. intricatum differs from *Rh. vicarium* in the same characters as does *Rh. blepharocalyx*, only it has 10 stamens.

Rh. nitidulum.—Is a much broader-leaved species than *Rh. vicarium* and the prominent scintillating scales of the upper-leaf indumentum are characteristic and give the leaf a different look from the opaque surface with its drying-up scales in *Rh. vicarium.* Its hardly contiguous uniform underleaf scales are a contrast to the bi-coloured scales in *Rh. vicarium.* It has a membranous calyx with unequal lobes 2 mm. long sparingly ciliate at apex whereas the calyx of *Rh. vicarium* is nearly obsolete and has no cilia but is scale-fringed. Its .funnel-shaped corolla elepidote outside with tube about 5 mm. long and oval obovate lobes 1 cm. long is a different construction from the campanulate corolla lepidote outside with tube about 2.5 mm. long and oblong or oblong-oval lobes 8 mm. long in *Rh. vicarium.* Its conic ovary with style longer than stamens contrasts with the cylindric ovary and style shorter than stamens in *Rh. vicarium*, as does its capitate stigma with the discoid stigma of *Rh. vicarium.* Soulié's No. 2772 is certainly not *Rh. nitidulum.*

Rh. nitidulum var. *nubigenum* differs chiefly from the type in having smaller leaves and larger calyx and by so much is more different from *Rh. vicarium.*

Rh. polifolium.—As I am for the moment in difficulties over this species I cannot write from observation. A Paris specimen in Edinburgh Herbarium under the name is not the plant and

is perhaps a new species. I can therefore only compare *Rh. vicarium* with Franchet's description of his species *Rh. polifolium* and this I now do. Franchet says nothing about indumentum but places *Rh. polifolium* near *Rh. thymifolium.* If that be so one would expect the underleaf indumentum to be grey or brown of contiguous scales and punctulate. The punctulation is not very prominent in *Rh. thymifolium* however and might be missed even by Franchet who first noticed it in *Rh. nigropunctatum.* Certainly *Rh. thymifolium* indumentum is very different from the bi-coloured fulvo-rufous indumentum of *Rh. vicarium* and our Paris specimen under *Rh. polifolium* (that name has been substituted for *thymifolium* on the ticket) shows the silver-grey shining under surface without punctulation such as is seen in the Subseries C * of the Lapponicum series, in which was included *Rh. polifolium* on the evidence of this Paris specimen. Flowers in *Rh. polifolium* are in a fascicle of 2–3, more often 2 ; there are many floriferous buds side by side at the ends of the branchlets without interposed leaves ; the inflorescence is lateral like that of *Rh. racemosum,* Franch. only more contracted. (This I do not find in the Paris specimen hence my interpretation that Franchet did not mean to speak of a fascicle ; † perhaps I am quite wrong, for the Paris specimen apart from this has a quite short style shorter than stamens, whilst true *Rh. polifolium* has a long one far exceeding the stamens.) Taking *Rh. polifolium* as having a fascicled inflorescence according to description this is very different from the solitary and paired flowers terminal in *Rh. vicarium.* Then *Rh. polifolium* true has exserted stamens and style far exceeding stamens, in *Rh. vicarium* the stamens are shorter than corolla and the style is shorter than the stamens. Calyx-lobes in *Rh. polifolium* are ovate or ovate-deltoid 1–2 mm. long and ciliate, whilst in *Rh. vicarium* there is the obsolete scale-fringed eciliate calyx. Certainly *Rh. vicarium* is not the *Rh. polifolium* of Franchet's description.

Rh. psilostylum is easily separated by its indumentum and yellow flowers.

Rh. ramosissimum.—Rehder and Wilson's plant from Tatsienlu is not the true *Rh. ramosissimum.* What it is I cannot yet say—possibly a new species. But *Rh. vicarium* is not Franchet's *Rh. ramosissimum* having a puberulous corolla-throat and it is not Rehder and Wilson's species a comparison with which will be made at some other time.

Rh. verruculosum.—This species has pilose as well as lepidote twigs, *Rh. vicarium* has only lepidote ones. The leaves are oval or elliptic-ovate, in *Rh. vicarium* oblong-oval or oval or oblong-

* See Notes R.B.G. Edin., ix (1916), 310. † Ibid., *l.c.*

ovate. Upper surface has scales "flavidis lucidis"—the surface is opaque in *Rh. vicarium*. Scales on under surface not contiguous and dark-coloured ones are scattered evidently punctulate in *Rh. verruculosum*, in *Rh. vicarium* equally distributed. Flowers solitary, but 2 in *Rh. vicarium*. Calyx-lobes ovate or rounded 1–2 mm. long densely villous-ciliate, in *Rh. vicarium* obsolete scale-fringed. Corolla funnel-shaped with tube 4 mm. long but in *Rh. vicarium* tube campanulate 2.5 mm. long—in both corolla is lepidote. Stamens 7–8 not 10. Ovary conic not cylindric. Style much longer than stamens, not shorter as in *Rh. vicarium*. Stigma capitate not discoid. Quite distinct from *Rh. vicarium*.

Rh. Websterianum is one of the silvery underleafed forms with large flowers and long exserted style. It is not like *Rh. vicarium*.

Rh. violaceum.—Has the same habit. Leaves are sometimes acute never in *Rh. vicarium*. Flowers 1–3, in *Rh. vicarium* usually 2. Petiole 2–3 mm., the maximum is 2 mm. in *Rh. vicarium*. Calyx-lobes 0.5–2 mm., ovate or rounded on a cupular base, ciliate at apex but as in *Rh. vicarium* the margin is lepidote and often scarious, in *Rh. vicarium* I have not seen a scarious margin nor cilia and the lobes are nearly obsolete the whole calyx barely 0.5 mm. long. Corolla funnel-shaped glabrous outside, tube 4–5 mm. long, in *Rh. vicarium* tube campanulate 2.5 mm. long and corolla lepidote. Ovary conic not cylindric. Style exceeding stamens not shorter. Stigma capitate not discoid. Capsule ovoid not oblong 5 mm. long not 4 mm. *Rh. vicarium* is nearest to this species but is distinct. From the specimen and description I take the main differences to be :—

Leaves larger and more glossy in *Rh. vicarium*.
Calyx-lobes much smaller 0.5 mm. long and more lepidote and fleshy eciliate.
Corolla-tube shorter 2.5 mm. campanulate. Corolla lepidote not glabrous outside puberulous not villous inside.
Ovary much smaller narrow cylindric.
Style shorter than stamens.
Capsule narrowly oblong.

The type of *Rh. violaceum* I have seen is Wilson No. 3460, and there are two distinct plants under the number—one with discontiguous underleaf indumentum is certainly not the *Rh. violaceum*.

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Rhododendron Vilmorinianum, Balf. f.* (Triflorum.)

An erect bush in cultivation with rigid straight stiff thin branches. Branchlets of the year barely 1 mm. in diameter

* *Rhododendron Vilmorinianum*, Balf. f. —Frutex erectus ramis strictis rigidis tenuibus. Ramuli hornotini vix 1 mm. diam. puberuli et sparsim setulosi sigillatim lepidoti, annotini puberuli et sparsim lepidoti et setulosi erubescentes. Folia petiolata oblongo-lanceolata ad 6 cm. longa; lamina ad 5 cm. longa 1.8 cm. lata acutim attenuata et longe mucronata, margine crenulata ciliata, basi obtusa,

finely puberulous and with a few scattered twisted bristles also lepidote with white large adpressed seal-like peltate uniform scales .25 mm. in diameter irregularly distributed some discontiguous others contiguous year-old branchlets reddening the scales becoming reddish or yellowish. Foliage-bud ovoid narrowed to top shorter and thicker than in *Rh. Augustinii* finely puberulous and sparsely lepidote solitary terminal or forming an apical cluster, last foliage-leaves close beneath the bud which has several outer leaves intermediate to foliage and true scale-leaves (each with an axillary bud), outer scale-leaves short rounded or broadly ovate or broadly triangular, pointed shortly acuminate not caudate, more or less puberulous and lepidote outside, followed by oblong or long oval or ovate scale-leaves becoming gradually more convolute the inner of which have distinct midrib and are most lepidote on both sides of it ; innermost green enclosing the concave erect slightly convolutely overlapping young foliage-leaves which have a few peltate scales scattered on each side of midrib of epilose upper surface save for puberulous midrib and the under surface epilose lepidote with white seal-like scales almost contiguous, the margin with a few long twisted hairs ; petiole puberulous and with a few long setulose hairs. Leaves petiolate as much as 6 cm. long stiff horizontally spreading ; lamina chartaceous oblong-lanceolate as much as 5 cm. long 1.5 cm. broad tapered to an acute point ending in a prominent red-topped apiculate mucro, margin cartilaginous notched sparsely bristly-ciliate or eciliate flat or obscurely recurved, base obtuse ; upper surface dark green often becoming dark purple-red mat flat not bullate but finely rugulose and minutely papillose epilose excepting the grooved puberulous midrib, primary veins some 8 or 9 on each side hidden, lepidote with a few blackish or reddish distant peltate scales about the midrib, intervals between the scales much wider than the scales (about 1 in a sq. mm.), scales often difficult to see in old leaves ; under surface pale green becoming slightly tawny lepidote with many brown nearly uniform peltate scales filled with reddish secretion discontiguous, intervals between the scales about width of scales (3–5 in a sq. mm.) midrib elevated paler and like rest of supra atroviridis nunc purpureo-rubra opaca plana haud bullata epilosa (costa media sulcata puberula excepta) squamis distantibus sparsim lepidota ; infra pallide viridis nunc subfulva epilosa squamis rufis discontiguis uniformibus lepidota, costa media elevata glabra ; petiolus circ. 1 cm. longus puberulus et sparsim lepidotus, margine setulosus. Flores in umbellas solitarias terminales 3-floras dispositi ; pedicelli vix 1 cm. longi squamis albidis discontiguis lepidoti. Calyx parvus. Corolla zygomorpha alba varo flavo basali et maculis aurantiacis notata extus sparsim lepidota epilosa ; lobi undulato-lobulati. Stamina 10 inaequalia corollam vix aequantia ; filamenta pubescentia ; antherae kermesinae. Gynaeceum staminibus longius corollam subaequans ; ovarium lepidotum pilocristatum ; stylus basi puberulus.

surface epilose, primary veins invisible ; petiole about 1 cm. long commonly reddish finely puberulous and sparingly lepidote its margin bristly with twisted bristles. Flowers in a terminal 3–flowered umbel ; flower-bud globular ovoid smaller than in *Rh. Augustinii* solitary with a cluster of small foliage-buds one in each leaf-axil below and close up to it ; bracts falling as the flowers open, inner bracts at time of fall brown crustaceo-membranous oblong truncate apiculate cucullate outside lepidote puberulous, margin ciliate, inside more or less silkily adpressed hairy, about 1.2 cm. long 6 mm. broad ; bracteoles filiform at first white then brown membranous about 1.3 cm. long longer than pedicel adpressed hairy throughout on back and towards top sparingly lepidote hair-crested ; pedicels short green about 8 cm. long 1.5 mm. in diameter densely but discontiguously white lepidote with small scales, not expanding into the calyx-cup set on straight or only slightly oblique to axis of flower. Calyx green lepidote outside lobes sometimes faintly tinted ochre at top ; cup about 1 mm. long somewhat fleshy 5-lobed ; lobes unequal postero-lateral largest elongated triangular or oblong obtuse or deltoid as much as 1.5 mm. long often less, anterior lobes minute teeth on margin of calyx-cup, margin ciliate. Corolla butterfly-shaped but not conspicuously so greenish in bud at first yellowish-white then white with ochre-coloured spots posteriorly inside on disk of limb, about 3.5 cm. long lepidote all over outside with distant white peltate scales epilose, puberulous inside at base of disk of limb ; tube oblique funnel-shaped about 5 mm. long in front, longer behind, slightly laterally compressed about 1.5 mm. in diameter at base and there slightly fleshy and gibbous especially posteriorly, deeply grooved outside and correspondingly ridged inside expanding upwards into a concave limb with 5 spreading recurving lobes ; disk of the limb somewhat rugose ; lobes oval or oblong oval with beautifully undulate almost fringed margin subequal a little over 2 cm. long and nearly 2 cm. broad. Stamens 10 unequal, longest barely as long as corolla about 3.3 cm. long with anther about 2.5 mm. long, shortest about 2.3 cm. long with anther 1.5 mm. long all spreading not so declinate as usual in the Triflorum series ; filaments white slightly dilated downwards glabrous at base over 3.4 mm. then hair-tufted and densely pubescent above the ovary filling up base of concave limb of corolla, glabrous above ; anthers crimson. Disk green with a dense fringe of hairs at top. Gynaeceum about 3.5 cm. long a little longer than stamens and about same length as corolla ; ovary about 2.5 mm. long and 1.5 mm. in diameter conoid angular green lepidote with translucent white small scales hair-crested at top ; style delicate greenish-yellow glabrous but with a very few short

hairs on it above the ovarian hair-crest slightly clavate at top with a green lip under the small flat green lobulate stigma which is hardly as broad as the style.

Raised by M. de Vilmorin from seed probably collected by Farges in E. Szechwan.

This is a plant which seems to pass commonly in gardens as the white-flowered form of *Rh. Augustinii*, Hemsl. There is a figure of it in Flora and Silva, iii (1905), 162. The plant is not *Rh. Augustinii*. Everyone who has grown *Rh. Augustinii* knows the character by which the species is readily recognised—the downy midrib on the under surface of the leaves which surface is otherwise lepidote but not hairy. Search for it in *Rh. Vilmorinianum* is vain. There then is a technical diagnostic mark between the species. It is one that can be seen at all times making easy recognition of plants not in flower. But it is by no means the only distinctive mark. The two plants are altogether different in habit. *Rh. Vilmorinianum*, whether grown in exposed situations outside or under shelter in a cool plant-house is a stiff erect shrub with straight diverging branches bearing stiff horizontal leaves with flat upper surface in the growing season, and during the resting period the leaves are often stiffly deflexed on petioles about one centimeter long, whilst *Rh. Augustinii* is a flexuously branched shrub with leaves usually convex above and drooping on petioles about half a centimeter long. The flower-buds are globular ovoid and stand up well above the leaves during the resting period, surrounded below by a small cluster of small vegetative buds; in *Rh. Augustinii* the flower-buds are ovoid pointed much narrower and longer and the vegetative buds below are longer. The inflorescence is in all the plants seen a 3-flowered umbel never rising to 6-flowered as in *Rh. Augustinii*, in which too there may occur a fascicle of umbels at the end of the branch, and the pedicels are short about one centimeter (or under it) long not 1.5–2 cm. The corolla as it elongates from the bracts is more or less green and changes through a yellowish-white to white with ochre-coloured spots posteriorly on the disk and the lobes are beautifully undulate almost fringed; in *Rh. Augustinii* the corolla shoots out with a lilac or blue tint and when expanded has the same tint with green spots and the undulations on the lobes are less pronounced. The stamens barely equal the corolla in length in *Rh. Vilmorinianum* not longer than the corolla as is usual in *Rh. Augustinii*, and the anthers are crimson not pink.

Whether there is in cultivation another white-flowered plant which is truly a form of *Rh. Augustinii* I do not know. The plant here described certainly differs from *Rh. Augustinii*.

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Regional Spread of Moisture in the Wood of Trees.

II.—Moisture-Spread in a Graft-Region.

BY

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With Plate CLXV.

An earlier paper * summarised the results of experiments on the spread of moisture in the wood of deciduous trees throughout the winter and early spring. The moisture present in each of the wood sections examined was expressed in terms of the percentage of the dry weight of the sections. In other words, the percentage represented the absolute amount of moisture present in 100 grms. (dry weight) of the wood of each particular section. This method of calculation has been objected to † on the grounds that a variable factor — specific gravity — is involved. I admit that an ideal result to have achieved would have been the separate estimation of the water of imbibition and the physiologically available or free water per unit volume.

At the commencement of the investigations various schemes were formulated for the purpose of arriving at definite conclusions along these lines. Every such theoretical scheme was in its turn abandoned when the practical details were considered. Some of the schemes involved, for example, the accurate determination of the volume of small, irregularly shaped pieces of dry wood—a process which would almost certainly lead to the introduction of errors. Other schemes, where accurate volumetric calculations were unnecessary, postulated very true cutting of the wood, so that all the ultimate sections should be of absolutely uniform dimensions and consequently of equal volume. The necessity for this accurate cutting of the sections militated against such a course of procedure. But a still greater objection, to my mind, was the consequent neglect of

* Craib in Notes Roy. Bot. Gard. Edin., xi, p. 1 (1918).

† Groom in Trans. Roy. Scot. Arb. Soc., xxxiii, p. 165 (1919).

[Notes, R.B.G., Edin., No. LIX, May 1920.]
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the annual ring as the unit structure of the wood. The necessary cutting of the wood into absolutely equal sections would result in many, if not all, of these sections having a disproportionate amount of either spring or summer wood. If the true balance between the two regions of the annual zone be not preserved, then, as has been proved experimentally, distorted results will follow. There is another objection. Uniformity in the wood would be postulated, *e.g.* an occluded dead branch would vitiate the whole results, or, if the branch were cut out, allowance could only be made by accurate volumetric determination.

As confirming the results arrived at by the methods adopted by me, we find that newly felled timber, especially when seen in median longitudinal section, gives a visible demonstration of the distribution of the moisture. An approximate graphic representation of the moisture-distribution can be made from a glance at the newly felled wood. This statement is made on the strength of results of trials during the experiments. On several occasions I constructed graphs of the moisture-distribution from the appearance of the wood in longitudinal section, and these graphs agreed in their main details with the graphs made from the calculations following on the drying of the sections.

That the main details of the moisture-distribution can be gauged from visual examination can be confirmed, I think, by reference to the accompanying plate, which is a reproduction of a photograph through the graft-region of a newly felled tree of which the scion was a form of *Pyrus Aria* and the stock was probably *Pyrus Aria*.

Excluding the dark-coloured heartwood, which occurs only in the stock, we find that both stock and scion have a central pale-coloured area bounded on both sides by darker-coloured areas. The colour-shades are due to the moisture-content, the darker-coloured areas having a much higher moisture-content than the paler-coloured, and the transition between the two areas is not abrupt but gradual. A graph constructed from these details would be low in the central region, rising with some irregularities through the intermediate region to its maximum in the youngest wood. This brief general description would apply to the graph of the lower parts of the trunk of *Acer Pseudoplatanus* for March * if we leave out the very dry youngest wood of the *Acer*. And with the same proviso the two finished graphs correspond in their general outline.

So far I have referred to the accompanying plate as a visible demonstration of moisture-distribution in wood. Of much more interest are the deductions to be drawn from an examination

* Craib in Notes Roy. Bot. Gard. Edin., xi, pl. clix (1919).

and comparison of the conditions found in the stock and in the scion. As a preliminary it will be well to give a fuller description of the plate.

As already stated, the stock was probably *Pyrus Aria*, and the scion was a form of that species. The tree was felled entire on the morning of 9th April 1919, at which time the buds were considerably swollen, though none were yet open. The spread of the moisture radially away from the centre has made considerable progress, the stage reached in this movement being, as noted above, practically that of the March *Acer*.

The line of the graft is shown very clearly marking off the stock and the scion as two regions whose physiological activities, at least as regards moisture-spread, do not synchronise. The stock is visibly ahead of that part of the scion immediately above it in the extent to which the radial spread of the moisture has been carried. As a natural consequence of the more advanced stage reached by the stock, we find that a wet part of the scion overlies a dry part of the stock. Without some restraining influence, we should naturally expect the moisture from the wetter region to diffuse downwards along the walls of the drier cells immediately below.

Cannot one deduce from this that the moisture-spread is a controlled or vital phenomenon and not a purely physical one? To all intents and purposes a grafted tree of this age is structurally one tree, and if the moisture-spread were a purely physical happening then there would not be such a marked and sudden difference in the amount of the spread above and below the graft-line. Both stock and scion perform their accustomed cycles independently. This touches many important biological problems, the consideration of which must be dealt with in subsequent papers.

EXPLANATION OF PLATE CLXV.

Illustrating Professor Craib's paper on Regional Spread of Moisture in the Wood of Trees.

PLATE CLXV.—Photograph of graft-region in longitudinal section, showing moisture-distribution above and below the graft-line. Photograph taken immediately after the tree was felled.

MOISTURE-SPREAD IN A GRAFT-REGION.

DIAGNOSES

Specierum novarum in herbario Horti Regii Botanici Edinburgensis cognitarum.

CCCCLI-D.

THE species and varieties described in this series are :—

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5620 **Ajuga sciaphila,** W. W. Sm. Sp. nov.

Inter species chinenses affinis *A. ovalifoliae,* Bur. et Franch. a qua habitu subprostrato, petiolis laminam aequantibus, calyce longe et sparsim piloso inter alia differt ; ab *A. lobata,* D. Don foliis ovatis basi breviter decurrentibus haud cordatis recognoscitur.

Planta semi-prostrata 10–15 cm. alta, ramis inferioribus longe decumbentibus ; caules petiolique pilis longiusculis albidis plus minusve dense induti. Folia petiolo alato subaequilongo suffulta ; lamina 3–5 cm. longa, 2.5–3.5 cm. lata, ovata, apice rotundata vel obtusa, basi breviter decurrens, margine undulato-lobatula, pallido-virens, utrinque pilis longis paleaceis subdense conspersa. Verticillastri 2–6-flori, inconspicui, inter folia subcelati ; flores breviter (3–5 mm.) pedicellati, laete caerulei. Calyx circ. 7 mm. longus anguste tubulosus pilis longiusculis laxis sparsim indutus, fere ad medium in lobos lanceolatos subacutos divisus. Corolla fere 2.5 cm. longa, extra hic illic pilis longis conspersa, tubo recto anguste cylindrico ad fauces ampliato ; limbus conspicuus circ. 1 cm. longus, lobis superioribus brevissimis, labii lobo intermedio lateralibus multo longiore emarginato. Stamina e tubo paululo exserta. Fructus maturus deest.

"West China:—Yangtze-Yungning divide, Yunnan, on shady banks in mixed and pine forests. Lat. 27° 40′ N. Alt. 10,000 ft. Semi-prostrate plant of 4–6 inches. Flowers bright blue. June 1914." G. Forrest. No: 12,470.

1894 **Ardisia shweliensis,** W. W. Sm. Sp. nov.

Species affinis *A. macrocarpae*, Wall. et *A. maculosae*, Mez; a priore foliis multo longioribus et latioribus acuminatis margine vix crispatis inter alia signa differt; ab altera foliis latioribus, inflorescentiis paucifloris, floribus majoribus inter alia divergit.

Frutex 1–2 m. altus; rami glabri; ramuli florigeri graciles 8–10 cm. longi parce vel vix punctulati, ad apicem folia 2–3 gerentes. Folia petiolo ad 1 cm. longo glabro praedita; lamina plerumque 8–16 cm. longa, 4–7 cm. lata, oblongo-elliptica vel lanceolato-elliptica, apice mediocriter acuminata, basi cuneata, margine remotiuscule crenata plana vix crispata, membranacea, utrinque glabra; costa conspicua nervis 10–15-jugis subtus satis eminentibus; glandulae typicae subgeneris *Crispardisiae*, Mez conspicuae subremotae una cum punctulis numerosis marginem sequentibus; lamina subtus punctulis nigris saepius elongatis dense notata. Inflorescentiae terminales, paucifloræ (6–12-florae), umbelliformes, glabrae; pedunculus circ. 5 mm. longus; pedunculi secondarii 3–4, circ. 5 mm. longi pedicellis 1 cm. longis punctatis multo breviores; bracteae 2–3 mm. longae, ovatae vel oblongae, obtusae, dense nigro-punctatae. Flores ante anthesin circ. 7 mm. longi glabri. Sepala circ. 2 mm. longa, oblonga, obtusa, nigro-punctata et -striata. Petala circ. 8 mm. longa, ovato-lanceolata, acuta, alba, maculata. Stamina petalis paulo breviora antheris acutis, dorso distincte punctulatis, filamentis brevibus. Ovarium ovoideum punctatum stylo corollam subaequante. Fructus deest.

"China:—Shweli valley, Yunnan, amongst scrub. Lat. 25° N. Alt. 5000–6000 ft. Shrub of 3–6 ft. Flowers white, spotted dull lake-crimson; anthers golden. May 1912." G. Forrest. No. 7934.

3685 **Arenaria salweenensis,** W. W. Sm. Sp. nov.

Species ex affinitate *A. inornatae*, W. W. Sm. a qua habitu elatiore, foliis supra scabridule pustulosis, inflorescentiis amplis praeter alia signa divergit.

Planta perennis 12–20 cm. alta. Radix elongata fusiformi-incrassata. Caules 3–4 vel nonnunquam multo numerosiores plus minusve erecti, pilis articulatis fulvidis vel nigridis plus minusve dense pubescentes. Folia in petiolum vix discretum latiusculum margine ciliatum attenuata, 3–5 cm. longa, 5–7 mm.

lata, lineari-oblonga, apice acutiuscula, margine angustissime scariosa, utrinque glabra nisi ad partem petiolarem, supra scabridule papillosa, costa media conspicua translucente, nervis valde obscuris. Inflorescentiae dichotome ramosae ultimo in cymas trifloras abeuntes ; flores albi roseo-suffusi ; pedicelli ad 1.5 cm. longi pilis articulatis nigridis dense induti ; bracteae lanceolatae foliis similes sed breviores. Sepala exteriora circ. 5 mm. longa, 1.5 mm. lata, oblonga, obtusiuscula, margine sparsim nigro-ciliolata, apice atro-rubescentia, interiora late scarioso-marginata. Petala 1 cm. paulo superantia, obovata, apice obscure erosa. Stamina 10 calycem subaequantia filamentis glabris basi glanduliferis. Ovarium 2 mm. longum stylis duobus circ. 2 mm. longis instructum. Fructus deest.

"West China :—N'Maikha - Salween divide, Yunnan, on stony pasture and humus-covered boulders in side valleys. Lat. 26° 25′ N. Alt. 10,000 ft. Plant of 5–8 inches. Flowers white, faintly stained rose-pink. Aug. 1919." G. Forrest. No. 18,474.

534 **Aristolochia Delavayi,** Franch., var. **micrantha,** W. W. Sm. Var. nov.

A type floribus duplo minoribus differt.

"West China :—Mountains of the Chungtien plateau, Yunnan, in open stony pasture. Lat. 27° 30′ N. Alt. 11,000 ft. Plant of 6–14 inches. Flowers dull olive-green. July 1914." G. Forrest. No. 12,637.

This can be compared with nothing in the Chinese flora but *A. Delavayi,* Franch., which I have not seen. It agrees well with the description, except that Franchet gives a length of 5–6 cm. to the calyx of his species. In Forrest's plant it does not exceed 2.5 cm.

45035 **Artemisia Forrestii,** W. W. Sm. Sp. nov.

Species affinis *A. Campbellii,* Hook. f. et Thoms. a qua foliorum segmentis primariis lineari-oblongis integris, involucri phyllis glabris haud lanosis inter alia differt. Planta inodora e radice crassa lignosa orta ad 75 cm. alta. Caulis erectus sat robustus infra simplex, in dimidio superiore bene ramosus ramis elongatis suberectis, tomento albido dense indutus. Folia radicalia delapsa ; caulina numerosa caulem subcelantia 2–4 cm. longa simpliciter pinnatisecta, segmentis vulgo 5 remotiusculis vel saepe approximatis atque folia 5-fasciculata simulantibus lineari-oblongis vel loriformibus circ. 2 cm. longis, 2 mm. latis subacutis undique dense albido-lanato-tomentosis. Inflorescentiae numerosae paniculatae ramulos terminantes circ. 6 cm.

longae capitulis parvulis circ. 2.5 mm. diametro in racemos breves dispositis, foliis regionis floralis caulinis subsimilibus sed minoribus saepe fere simplicibus. Capitula heterogama ad 1 mm. pedunculata ; involucri phylla exteriora concava suborbicularia vel elliptica circ. 2 mm. longa obtusa late scariosa glabra, interiora paulo angustiora latius scariosa ; flores pauci 8–10, vix 2 mm. longi receptaculo nudo. Achaenia haud matura.

" West China :—Da-gu Shan, Yunnan, on open dry hillsides. Lat. 27° 40′ N. Alt. 10,000–11,000 ft. Plant of 20–30 inches. Phyllaries green ; flowers dull brown. Oct. 1918." G. Forrest. No. 17,082.

" Mountains in the N.E. of the Yangtze bend, Yunnan, on open stony pasture. Lat. 27° 45′ N. Alt. 11,000 ft. Plant of 12–16 inches. Flowers ? July 1913." G. Forrest. No. 10,506.

1204 **Campanula calcicola,** W. W. Sm. Sp. nov.

Species affinis *C. crenulatae,* Franch. et *C. chrysosplenifoliae,* Franch. ; a priore habitu graciliore, foliis bene hirsutis membranaceis, floribus minoribus, calycis lobis ovarium subaequantibus inter alia distinguitur ; ab altera ex descriptione caule piloso, corolla calycem multo superante praeter alia signa divergit.

Planta 5–10 cm. alta. Rhizoma crassum perpendiculare apice vaginis petiolisque emarcidis bene onustum. Caules plures 2–7, erecti vel suberecti, flexiles, simplices, uniflori, pilis longis patentibus albis undique induti. Folia basilaria plura petiolo albo-piloso 2–8 cm. longo munita ; lamina suborbicularis vel late ovata, 1.2–1.8 cm. diametro, apice rotundata, basi lobis rotundatis distincte cordata, margine obscure undulato-crenata, in sicco membranacea, supra pilis appressis paleaceis multis instructa, infra minus dense ; caulina infima basilaribus subsimilia sed minora, superiora lanceolata circ. 5 mm. longa breviter petiolata integra vel obscure denticulata longe albo-pilosa, suprema inter se remota fere subulata. Calycis segmenta 3–4 mm. longa, lineari-lanceolata, erecta, infra denticulis atris binis notata sparsim albo-pilosa. Corolla coerulea calyce multo longior ad 15 mm. longa, ad tertiam partem lobata, lobis ovatis paulo acutatis. Ovarium 3–4 mm. longum pilis longis patentibus albis dense obsitum. Capsula matura deest.

" West China :—Mountains of the Yungning-Yangtze divide, Yunnan, on ledges of dry limestone cliffs. Lat. 27° 40′ N. Alt. 10,000–11,000 ft. Plant of 2–4 inches. Flowers blue. July 1914." G. Forrest. No. 13,081.

The following is dwarfer with glabrescent ovary and calyx teeth :—

"Mountains N.E. of the Chungtien plateau, Yunnan, on ledges of limestone cliffs. Lat. 27° 40′ N. Alt. 13,000 ft. Plant of 2–3 inches. Flowers deep blue. Aug. 1914." G. Forrest. No. 13,108.

This new species is a much smaller plant than the glabrous and glaucescent *C. crenulata*, Franch. It approaches *C. chrysosplenifolia*, Franch., but differs according to the description in the simple long-pilose stems, in the cauline leaves, and in the relative lengths of calyx-lobes, ovary, and corolla. It may however be an extreme form of that species.

7531 **Ceropegia aridicola,** W. W. Sm. Sp. nov.

Species affinis *C. Balfourianae*, Schltr. a qua habitu, foliis cordatis subsagittatis, floribus duplo minoribus inter alia signa differt.

Planta 15–20 cm. alta vel ex collectore nonnunquam ad 50 cm. attingens; caudex tuberosus ad 3 cm. diametro saepe subglobosus; radices elongatae carnosae. Caules 1–2-nati, ut videtur plus minusve decumbentes flexuosi gracillimi ramosi laxe foliati, basi nudi, pilis brevibus crispatis albidis bene muniti. Folia petiolo 4–6 mm. longo crispato-piloso praedita; lamina vulgo 0.5–1.5 cm. longa, 3–10 mm. lata, anguste triangularis, apice acuminata, basi cordata atque subsagittata, margine integra vel paulo undulata, paulo carnosula, supra pilis crispatis scabridule conspersa infra subglabra, costa media conspicua pilosula, nervis lateralibus obscuris. Flores ex axillis superioribus fere omnibus 1–3-nati saepe solitarii; pedicelli 3–10 mm. longi pilosuli. Calycis 3–4 mm. longi lobi lineari-lanceolati acuminati glabri vel pilis paucis conspersi. Corolla circ. 1.5 cm. longa, e basi subgloboso-inflata ibique circ. 4 mm. lata, in tubum circ. 5 mm. longum producta, extra sparsim pilosula intus glabra; lobi circ. 5 mm. longi ovato-lanceolati vel subrhomboidei extra pilis perpaucis praediti intus glabri; corona poculiformis foliolis ovatis obtusis glabris vix 1 mm. longis, ligulis lineari-spathulatis erectis glabris 2–3 mm. longis tenuissimis purpureo-tinctis. Folliculi maturi circ. 4.5 cm. longi, seminibus 5 mm. longis nigridis albo-comosis.

"West China:—Mountains in the N.E. of the Yangtze bend, Yunnan, on dry stony pasture. Lat. 27° 45′ N. Alt. 10,000 ft. Plant of 6–8 inches. Flowers greenish-white, tinged purplish at apex. July 1913." G. Forrest. No. 10,549.

"N.W. flank of the Lichiang Range, Yunnan, on open stony pasture. Lat. 27° 30′ N. Alt. 10,000 ft. Plant of 9–20 inches. Flowers yellowish-green and red-purple. July 1914." G. Forrest. No. 12,794.

"Mekong-Salween divide, Yunnan. Lat. 28° 10′ N. Alt. 10,000 ft. Sept. 1914." G. Forrest. No. 13,394.

10892 **Ceropegia dolichophylla,** Schltr., var. **purpureo-barbata,** W. W. Sm. Var. nov.

A typo corollae lobis intus pilis vesiculosis longis pallido-purpureis vestitis differt.

"West China:—Mekong valley, Yunnan, on grass and dwarf scrub in stony situations. Lat. 27° 40′ N. Alt. 8000–9000 ft. Scandent plant of 2–3 ft. Flowers green and purple-maroon. Aug. 1914." G. Forrest. No. 13,024.

"On the Tong Shan, Yunnan, in open dry situations amongst rocks. Lat. 27° 20′ N. Alt. 8000 ft. Scandent plant of 3 ft. Flowers yellow, green at base, deep magenta-rose at apex and fringed. July 1914." G. Forrest. No. 12,738.

7542 **Ceropegia monticola,** W. W. Sm. Sp. nov.

Species affinis *C. pubescenti,* Wall. a qua pedunculis brevibus hirsutulis, corollae lobis intus longe albo-pilosis inter alia recedit; affinis autem *C. Arnottianae,* Wight et *C. macranthae,* Wight quae foliorum corollaeque forma differunt.

Planta scandens 60–150 cm. alta; radix non visa. Caulis valde flexuosus ramosus laxe foliatus pilis albidis patentibus bene conspersus. Folia petiolo circ. 1 cm. longo hirsutulo suffulta; lamina majorum 4–8 cm. longa, 3–5 cm. lata, plus minusve late ovata, apice breviter acuminata, basi vulgo rotundata, margine ciliata, in sicco membranacea, supra pilis appressis bene instructa, infra glabra nisi ad costam prominulam sparsim pilosulam. Pedunculus vulgo brevis nunc 4–15 mm. longus multiflorus hirsutulus; pedicelli 5–10 mm. longi subumbellati glabri. Calycis 5 mm. longi lobi subulato-lineares glabri. Corolla circ. 3.8 cm. longa extra glabra, tubo circ. 2.2 cm. longo basi distincte inflato fauce multo ampliato, lobis 1.6 cm. longis lineari-lanceolatis intus longe albo-pilosis; coronae lobi 10 lanceolati acuminati ciliati ligulis duplo longioribus linearibus erectis minutissime pilosulis.

"West China:—Mountains in the N.E. of the Yangtze bend, Yunnan, on grass on the margins of pine forests. Lat. 27° 45′ N. Alt. 11,000 ft. Scandent plant of 2–3 ft. Flowers yellowish-green and maroon. Aug. 1913." G. Forrest. No. 10,944.

"Bei-ma-shan, Mekong-Yangtze divide, Yunnan, on scrub amongst boulders. Lat. 28° 20′ N. Alt. 10,000 ft. Scandent plant of 2–5 ft. Flowers deep livid maroon-purple. Aug. 1914." G. Forrest. No. 13,198.

7543 **Ceropegia muliensis,** W. W. Sm. Sp. nov.

Species ex affinitate *C. angustifoliae,* Wight a qua corollae lobis linearibus praeter alia signa differt ; a *C. pubescente,* Wall. foliis anguste lanceolatis, corolla duplo minore recedit.

Planta scandens 30–60 cm. alta ; tubera non visa, ex collectore indigenarum cibaria ; radices carnosae elongatae. Caulis valde flexuosus gracillimus ramosus laxe foliatus basi nudus indumento crispulo bene indutus. Folia petiolo circ. 1 cm. longo crispato-pilosulo praedita ; lamina majorum 10–13 cm. longa, 2–3 cm. lata, anguste lanceolata, apice longe acuminata, basi cuneata, in siccó membranacea, supra pilis parvis crispatis conspersa, infra glabra, costa media eminente pilosula excepta. Pedunculus ad 4 cm. longus pilosulus multiflorus ; pedicelli circ. 1 cm. longi subumbellati glabri vel pilosuli. Calycis 3–4 mm. longi lobi lineari-lanceolati acuminati glabri. Corolla fere 3 cm. longa glabra, tubo 2 cm. longo gracillimo ad medium vix 1 mm. lato basi paulo inflato fauce vix ampliato lobis linearibus circ. 9 mm. longis ; coronae lobi minuti ovati acuminati ciliati ; ligulae lineares erectae duplo vel triplo longiores ciliatae. Folliculi maturi circ. 9 cm. longi.

" West China :—Chungtien plateau, Yunnan, on grass and scrub in open situations. Lat. 27° 30′ N. Alt. 9000 ft. Scandent plant of 3–4 ft. Flowers olive-green, flushed maroon at base. Aug. 1914." G. Forrest. No. 13,117.

" Muli Mountains, S.W. Szechwan, on grass and dwarf scrub. Lat. 28° 12′ N. Alt. 10,000 ft. Scandent plant of 2–4 ft. Flowers purple and green. Tubers eaten by natives. Aug. 1918." G. Forrest. No. 16,648.

930 **Cleome yunnanensis,** W. W. Sm. Sp. nov.

Species inter affines asiaticas foliis trifoliatis, caulibus petiolisque foliisque inflorescentiisque glandulosis, staminibus sex, disco unilaterali inter alia bene notata.

Planta herbacea erecta ad 60 cm. alta. Caules in specimine nostro tres e basi lignosa orientes capillis patentibus glanduloso-capitatis densissime induti. Folia alterna petiolo 4–6 cm. longo dense glanduloso suffulta ; foliola tria, sessilia vel fere sessilia, plerumque 5–7.5 cm. longa, 2–2.5 cm. lata, lanceolata, apice acuminata, basi asymmetrice cuneata, supra sparsim pilosula, infra ad costam nervosque glanduloso-pilosula, margine glanduloso-ciliata, texturā in sicco membranacea. Inflorescentia terminalis multiflora corymboso-racemosa ; pedicelli inferiores 1–1.5 cm. longi dense glandulosi ; flores vix bene evoluti virides vel flavido-virides. Sepala 4, lanceolata, acuta, circ. 3 mm. longa, viridia, extra et ad margines dense glandulosa.

Petala 4, obovata, apice plus minusve obtusa, circ. 4 mm. longa (vix perfecte evoluta), glabra, flavido-viridia. Discus in structuram carnosulam circ. 0.5 mm. longam unilateraliter productus. Stamina 6, antheris circ. 2 mm. longis, filamentis 1 mm. longis. Ovarium sessile filamenta staminum paulo superans, stylo nullo.

"China :—Chungtien plateau, Yunnan, in open pasture. Lat. 27° 30′ N. Alt. 11,000 ft. Plant of 2 ft. Flowers green. June 1917." G. Forrest. No. 13,762.

This *Cleome* occurs at a remarkable elevation for the genus and is apparently the only one recorded from Yunnan.

15036 **Cremanthodium angustifolium,** W. W. Sm. Sp. nov.

Species capitulo discoideo praedita ; a speciebus ejus modi, *C. discoideo*, Maxim., *C. caloto*, Diels, *C. campanulato* (Franch.), Diels, *C. cucullifero*, W. W. Sm. foliis praelongis lineari-lanceolatis facile distinguitur.

Planta 25–50 cm. alta radicibus carnosulis multis munita. Folia radicalia numerosa congesta erecta praelonga, ad 24 cm. longa, 1.5–2 cm. lata, lineari-lanceolata, apice acuta vel subacuta, basi vix petiolata sed in partem vaginiformem membranaceam lamina paulo latiorem ampliata, alutacea, utrinque glabra, in sicco pallido-viridia, costa media subconspicua, nervis secundariis vulgo 4–6 costae subparallelis subobscuris, reticulatione ultima evanescente ; folia caulina vulgo 3, sessilia, 5–9 cm. longa, forma atque textura basilaribus subsimilia ; ad apicem caulis et sub capitulo apparent folia 2–3 bracteiformia, 1–1.5 cm. longa, linearia vel subulata. Caulis ipse capitulo solitario terminatus, infra glaber, supra pilis albidis vel fulvidis gradatim villosior, apice villosissimus. Capitulum discoideum, in sicco complanatum circ. 3 cm. diametro ; involucri phylla 12–13 mm. longa, circ. 2 mm. lata, lanceolata, acuta vel acuminata, pilis fulvidis vel subrufescentibus praesertim ad medium dense induta, in vivo saturate atro-kermesina, in sicco nigrida. Flores disci aurantiaci ; corolla circ. 8 mm. longa ; pappus sordide albus corollam subaequans. Achaenia immatura circ. 2 mm. longa oblonga glabra.

"West China :—Mountains in the N.E. of the Yangtze bend, Yunnan, in open stony pasture. Lat. 27° 45′ N. Alt. 12,000 ft. Plant of 12–16 inches. Florets dull orange ; phyllaries deep black-maroon. July 1913." G. Forrest. No. 10,653.

"Mountains of the Chungtien plateau, Yunnan, in open stony pasture. Lat. 27° 30′ N. Alt. 14,000 ft. Plant of 10–20 inches. Florets fragrant, deep ruddy orange ; phyllaries dull black-crimson. July 1914." G. Forrest. No. 12,809.

The elongated linear-lanceolate leaves and discoid capitulum make this species a very distinct one in the genus.

45037

Cremanthodium bulbilliferum, W. W. Sm. Sp. nov.

Species affinis *C. Decaisnei*, Clarke a quo foliis caulinis 3–4 magnopere vaginatis atque bulbilliferis divergit.

Planta ad 30 cm. alta radicibus carnosulis multis praedita. Caulis sat validus infra puberulus et subglabrescens, supra ad capitulum solitarium dense nigrido-villosulus. Folia radicalia pauca, sub anthesin 2–3, petiolo ad 11 cm. longo glabro suffulta ; lamina reniformis 3–5 cm. diametro, apice bene rotundata, basi alte cordata, margine laticrenata, crenaturis abrupte apiculatis, in sicco papyracea, utrinque glabra vel margine et ad insertionem petioli pilis rarissimis praedita, supra laete viridis, infra saepe purpurascens, nervis palmatim dispositis utrinque subconspicuis ; folia caulina 3–4 plus minusve orbicularia supra decrescentia, 1.5–3 cm. diametro, vagina valde dilatata saepe laminam aequante praedita, petiolo ipso nunc ad 1.5 cm. longo nunc obsoleto ; lamina ei foliorum radicalium similis ; bulbilli plures ovoidei circ. 4 mm. longi in vagina inclusi. Capitulum 3 cm. longum, in sicco ad 3 cm. latum ; involucri phylla uniseriata ad 12, circ. 2 cm. longa, 4 mm. lata, oblonga, apice acuta saepe paulo fimbriata, extra pilis nigridis conspersa. Flores aurantiaci ; disci florum corolla circ. 8 mm. longa ; ligulae ad 2.5 cm. longae, circ. 7 mm. latae, anguste oblanceolatae 2–3-dentatae ; pappus 8 mm. longus albus ; stigmata vix apice incrassata ; achaenia oblonga haud matura glabra.

" West China :—On Doker-la, Mekong-Salween divide, Yunnan, in open alpine meadows. Lat. 28° 20′ N. Alt. 13,000 ft. Plant of 9–12 inches. Ray florets dull orange, disc florets a deeper shade. Bulbils in axils of stem foliage. Aug.–Sept. 1918." G. Forrest. No. 17,229.

This species is closely allied to *C. Decaisnei*, Clarke and *C. reniforme*, Benth., differing chiefly in the huge vaginae of the more numerous cauline leaves with enclosed bulbils. Its marked pubescence distinguishes it further from the latter.

45038

Cremanthodium calcicolum, W. W. Sm. Sp. nov.

Inter species discoideas foliis basilaribus reniformibus longiuscule petiolatis atque vaginatis, caulinis latissime vaginatis, involucri phyllis glabris vel subglabris bene distincta.

Planta 20–30 cm. alta radicibus carnosulis multis praedita. Folia radicalia pauca, sub anthesin 1–3, vagina 5–8 cm. longa latiuscula praedita, petiolo 5–7 cm. longo glabro suffulta ; lamina reniformis vel suborbicularis 3–5 cm. diametro apice bene

rotundata, basi alte cordata, margine laticrenata, crenaturis obscure apiculatis, in sicco papyracea, utrinque glabra, supra laete viridis, infra multo pallidior subglauca, nervis palmatim dispositis infra subconspicuis ; folia caulina 1–2, vagina ampla latissima saepe lamina multo majore instructa, petiolo 1–2 cm. longo, lamina reniformi 2–4 cm. diametro ; nonnunquam folium supremum ovatum, quasi vagina sine lamina ; sub capitulo folia bracteiformia linearia 1–2 nunc inveniuntur. Caulis ipse capitulo solitario terminatus, infra glaber, supra gradatim fulvido-hirsutior, sub capitulo satis dense. Capitulum discoideum, in sicco 2–2.5 cm. diametro, basi sparsim villosulum ; involucri phylla ad 1 cm. longa, 3–4 mm. lata, oblonga, obtusa vel subacuta, glabra vel subglabra, in vivo atro-kermesina, in sicco nigrida. Flores disci aurantiaci ; pappus fulvidus 4–5 mm. longus ; achaenia immatura glabra.

" West China :—Mountains of the Chungtien plateau, Yunnan, on ledges of limestone cliffs and on limestone screes. Lat. 27° 30′ N. Alt. 14,000 ft. Plant of 7–12 inches. Phyllaries dull black-crimson ; florets dull orange. July 1914." G. Forrest. No. 12,711.

45039

Cremanthodium Farreri, W. W. Sm. Sp. nov.

Species affinis *C. reniformi,* Benth. et *C. Decaisnei,* Clarke ; a priore foliis subtus araneoso-villosis differt ; ab altero habitu elato, foliis caulinis pluribus recedit ; ab ambobus floribus albis deinde vinosis distinguitur.

Planta ad 50 cm. alta. Radices non visae. Caulis erectus sat validus simplex primum tomento albido-araneoso detersili praeditus. Folia radicalia ex speciminibus haud bonis sejuncta petiolo ad 10 cm. longo basi late vaginato suffulta ; lamina 4–5 cm. longa, circ. 4 cm. lata, ovata, apice plus minusve obtusa, basi subtruncata, margine dentato-crenata, papyracea, supra glabra, infra araneoso-tomentosa, nervis subpinnatim dispositis nec radiatim divergentibus ; folia caulina 3–4, inferiora 1–2 petiolo ad 10 cm. longo atque vagina ampla praedita (vagina nonnunquam foliacea margine dentata subtus araneoso-tomentosa), superiora 1–2 nunc vagina amplissima dentata instructa, petiolo deficiente, vel sessilia basi plus minusve amplexicaulia ; lamina inferiorum reniformis ad 4 cm. longa, ad 7 cm. lata, dentibus apiculatis dentata infra araneoso-tomentosa nervis subradiatim excurrentibus ; folia bracteiformia sub capitulo vulgo desunt, caule superiore longe nudo. Capitulum solitarium nutans circ. 4 cm. diametro basi albido-tomentellum ; involucri phylla circ. 20, ad 18 mm. longa, 3–7 mm. lata, ovato-lanceolata ad lineari-lanceolata, acuta vel acuminata, infra tomenti floccis induta, supra sparsius, in sicco nigrescentia ; ligulae ad 2.8 cm.

longae, lanceolatae vel ovato-lanceolatae, apice vulgo 2–3-dentatae, albae ; disci florum corolla circ. 8 mm. longa ; pappus 5–7 mm. longus albus. Achaenia matura circ. 4 mm. longa, suboblonga 10-costata brunnea.

" Upper Burma :—Chimili Alps. Alt. 12,500–13,000 ft. Local but locally abundant in dips and dells of the longer high-alpine grass. A stately species with pendulous globular-looking flowers of pure white, that deepen to dark dull claret-colour as they die. Aug. 1919." Farrer. No. 1178.

I am unable to refer the above species to any Himalayan or Chinese variation of *C. reniforme*, Benth. or *C. Decaisnei*, Clarke. In some respects it shows an approach to *C. Delavayi*, Franch.

45040

Cremanthodium suave, W. W. Sm. Sp. nov.

Species affinis *C. Heliantho* (Franch. sub *Senecione*) a quo foliis basilaribus lineari-lanceolatis longe petiolatis, caulinis subpatentibus, ligulis altiuscule dentatis recognoscitur.

Planta 20–40 cm. alta, radicibus multis fibrosis instructa. Caulis gracilis elatus basi petiolis vetustis ad fibras reductis indutus, glaber, capitulo solitario nutante terminatus. Folia radicalia vulgo 4–7, petiolo 4–6 cm. longo plus minusve alato atque a lamina vix discreto suffulta ; lamina 12–18 cm. longa, 2–2.5 cm. lata, lineari-lanceolata, apice acuta vel subacuta, basi longe cuneata, integra, in sicco tenuiter papyracea vel submembranacea, utrinque glabra, pallido-viridis, infra pallidior sed vix glauca, costa media conspicua, nervis secundariis angulo 20°–30° abeuntibus tenuibus ; caulina vulgo 4–6 sessilia, 3–9 cm. longa, lanceolata, supra decrescentia ; supremum involucri phyllis approximatum eisque simillimum. Capitulum 4–5 cm. longum, in sicco ad 2.5 cm. latum ; involucri phylla subbiseriata, exteriora 5–6 ovata vel ovato-lanceolata, 1.5–2 cm. longa, ad 1.2 cm. lata, obtusa vel acuta, pallido-viridia, glabra, interiora 4–6 breviora, 3–5 mm. lata, lanceolata, acuta, glauca, glabra. Flores fragrantes aurantiaci ; disci florum corolla circ. 8 mm. longa ; ligulae circ. 3 cm. longae, lineari-lanceolatae, acuminatae, altiuscule 3–4-dentatae ; pappus 4 mm. longus albus ; achaenia oblonga 3.5 mm. longa, sulcata, glabra.

" West China :—Mu-li Mountains, Szechwan, in open stony pasture on the margins of pine forests. Lat. 28° 12′ N. Alt. 12,000 ft. Plant of 9–16 inches. Flowers fragrant, golden-yellow. Aug. 1918." G. Forrest. No. 16,796.

" Duplicate of Forrest No. 16,796 in fruit. Sept. 1918." G. Forrest. No. 17,010.

A rival of *C. Helianthus* (Franch.) and *C. nobile* (Franch.), Diels, possessing the same fragrance.

4473 **Dianthera sinensis,** W. W. Sm. Sp. nov.

Species affinis *D. collinae*, Clarke a qua sepalis glanduloso-pilosis inter alia signa differt.

Planta herbacea circ. 1 m. alta basi procumbens nodis radicans, deinde erecta vel suberecta. Caules sulcati pilis crispatis plus minusve dense induti. Folia petiolo ad 2.5 cm. longo crispato-piloso suffulta; lamina foliorum majorum 6–8 cm. longa, 4–4.5 cm. lata, ovata, apice acuminata vel nunc obtuse breviterque angustata, basi breviter et late cuneata, membranacea, laete viridis, utrinque pilis paleaceis conspersa, nervis tenuibus circ. 8-jugis. Flores in paniculam terminalem compositi, albi, pro genere magni; axis dense albido-pilosa; bracteae ultimae et bracteolae lineares 2–3 mm. longae; pedicelli pilosi longiores ad 5 mm. longi. Calyx viridis pilis longiusculis glanduloso-capitatis patentibus conspersus fere ad imum in lobos lineares divisus, circ. 6 mm. longus. Corolla circ. 2.5 cm. longa, glabra, bilabiata, labio inferiore maculis brunneo-flavidis ornato. Stamina 2 filamentis glabris antheris muticis altero altius affixo, polline globoso minutissime echinato. Ovarium glabrum stylo glabro, stigmate subcapitato obscurissime bilobulo. Fructus simillimus ei *D. leptostachyae*, Benth. circ. 12 mm. longus, seminibus quatuor.

"West China:—Shweli-Salween divide, Yunnan, in open situations amongst rocks. Lat. 25° 20′ N. Alt. 9000 ft. Plant of 3–4 ft. Flowers creamy-white. July 1918." G. Forrest. No. 17,574.

This species is closely allied to *Justicia* and the species of *Dianthera* which appear in Hooker's Flora Brit. Ind., iv (1885), 542. In its large pedicelled flowers it comes nearest to *D. collina*, Clarke. The anther-cells are also superposed by almost the entire length of the anther. Later, in King and Gamble's Materials for a Flora Malay. Penins., Clarke instituted a new genus *Leda* in which he placed the Indian and Malayan species of *Dianthera*, keeping them apart from the American species. I do not find that *D. sinensis* quite conforms to the characters laid down by Clarke for *Leda*. The pollen of this species is globose, not ellipsoid, and minutely echinate. It has the pollen neither of *Justicia* nor of *Leda*. The material available of the allied species is not sufficient to warrant a definite decision and I am meanwhile relegating the plant to the genus *Dianthera* as characterised in the Genera Plantarum and the Flora of British India.

7655 **Elsholtzia pygmaea,** W. W. Sm. Sp. nov.

Species affinis *E. Bodinieri*, Vaniot a qua habitu annuo, foliis sublinearibus, bracteis diversis inter alia recedit.

Herba annua 2.5–7 cm. alta, erecta, simplex nisi in regione florali ; caulis basi nudus foliis sub inflorescentiam approximatis, strigosulus. Folia petiolo 2–3 mm. longo haud bene discreto praedita ; lamina 1–1.5 cm. longa, circ. 2 mm. lata, sublinearis vel lineari-lanceolata, apice subacuta, basi gradatim attenuata, margine obscure et remote serrulata, papyracea, utrinque pilis scabridulis conspersa, infra saepe purpurascens. Inflorescentia spiciformis simplex vel nonnunquam ramulis lateralibus duobus praedita, bracteis conspicuis gaudens. Bracteae circ. 4 mm. longae, 2.5 mm. latae, imbricatae, ovatae, apice cuspidatae, sparsim pilosulae, margine albo-ciliatae. Calyx 2 mm. longus, bracteis celatus, minute pilosulus, dentibus triangularibus acutis tubum fere aequantibus. Corolla circ. 8 mm. longa roseo-purpurea, infra albescens, sparsim pilosula, tubo cylindrico haud gibboso lobis saltem duplo longiore, lobo inferiore breviter quadrilobo. Stamina stylusque longiuscule exserta.

" West China :—Da-gu Shan, Yunnan, in open stony pasture. Lat. 27° 40′ N. Alt. 10,000 ft. Plant of 1–2 inches. Flowers deep rose-purple. Oct. 1918." G. Forrest. No. 17,128.

A tiny plant recalling some of the dwarf forms of *Elsholtzia strobilifera*, Benth.

640 **Fraxinus suaveolens,** W. W. Sm. Sp. nov.

Species sectionis *Orni*, affinis *F. floribundae*, Wall. et *F. retusae*, Champ. a quibus foliolis lateralibus brevissime petiolulatis, petiolulis ipsis dense ferrugineo-tomentosis inter alia differt.

Arbor vel frutex 7–17 m. altus ; rami hornotini mediocriter robusti paulo complanati rubidi glabri vel hic illic tomento ferrugineo conspersi, annotini cinerascentes lenticellis parvis albidis notati. Folia plerumque 3-juga, nonnunquam 1–2-juga longe petiolata ; petioli ad 10 cm. longi subteretes glabri vel reliquiis tomenti tenuissimi ferruginei conspersi ; petioluli laterales 1–2 mm. longi vel subobsoleti dense ferrugineo-tomentosi, medianus 5–15 mm. longus sub anthesin plus minusve ferrugineo-tomentosus ; rhachis petiolo excluso circ. 10 cm. longa hic illic tomento detersili praedita ; foliola (medianum plerumque paulo majus) 8–12 cm. longa, 2.5–4 cm. lata, lanceolata, apice longe acuteque acuminata, basi late cuneata vel oblique subrotundata, in sicco membranacea, per marginem totam regulariter crenato-denticulata, supra atroviridia glabra infra pallidiora ad costam ferrugineo-tomentosa ibique tandem glabrescentia ceteroquin glabra ; nervi plerumque 10–12 paria supra inconspicui infra paulo eminentes. Inflorescentia ut in *F. floribunda*, ampla, floribus pallido-flavidis fragrantibus ; axes glabri vel glabrescentes rubidi ; pedicelli circ. 2 mm. longi glabri. Calyx circ. 1 mm. longus campanulatus glaber dentibus

brevibus. Petala circ. 3 mm. longa lineari-oblonga. Stamina corollam paulo superantia. Fructus (si specimen Forrestianum num. 15,015 huc recte allocatum) circ. 2.2 cm. longus, linearispathulatus, apice rotundatus saepe retusus supra medium 4 mm. latus, basi calyce persistente inclusus 1 mm. latus.

"West China:—Western flank of the Lichiang Range, Yunnan, in mixed forests. Lat. 27° N. Alt. 10,000–11,000 ft. Tree of 40–50 ft. Flowers creamy-yellow, fragrant. May 1917." G. Forrest. No. 13,797.

"Mu-li Mountains, S.W. Szechwan, in open mixed forests. Lat. 28° 12′ N. Alt. 9000 ft. Shrub or tree of 20–40 ft. Flowers creamy-yellow, fragrant. June 1918." G. Forrest. No. 16,462.

"S.E. Tibet:—Doker-la, Mekong-Salween divide, Tsarong province, in mixed forests. Lat. 28° 25′ N. Alt. 10,000 ft. Shrub or tree of 30–45 ft. Flowers fragrant, creamy-yellow. June 1918." G. Forrest. No. 16,552.

"Mekong-Salween divide, Yunnan, in open mixed and pine forests. Lat. 28° 12′ N. Alt. 10,000–11,000 ft. Tree of 30–40 ft. In fruit. Oct. 1917." G. Forrest. No. 15,015.

This new species is closely allied to *F. floribunda*, Wall., which occurs also in Yunnan.

468 **Impatiens xanthocephala,** W. W. Sm. Sp. nov.

Species inter affines chinenses habitu nano, caule simplici, foliorum oppositorum lamina minima, floribus pro planta permagnis laminam foliorum duplo vel triplo superantibus, sepalis 4, alarum lobo distali longe stipitato, labello (cum calcare longo incurvo) purpureo-maculato bene notata.

Herba 5–10 cm. alta, glaberrima, caule simplici gracili basi aphyllo. Folia opposita petiolo ad 1 cm. longo saepe purpureo suffulta; lamina ad 1 cm. longa, ad 8 mm. lata, saepe multo minor, ovata, apice obtusa, basi late cuneata vel rotundata, margine pauci-crenata, nervis 2–3 paribus obscuris. Flores cuique plantulae 3–5, in axillis bractearum foliacearum lanceolatarum solitarii; pedicelli ad 1 cm. longi. Flores magni circ. 3.5 cm. expansi saturate aurantiaci, labello calcareque purpureomaculatis. Sepala 4, exteriora orbicularia, 2 mm. diametro, submembranacea, vix apiculata, costa tenui, 2 interiora multo minora, ovata, membranacea, mutica, costa obsoleta. Vexillum circ. 5 mm. longum, pro flore parvum, valde cucullatum, apice integrum, dorso ecristatum. Alae circ. 2.3 cm. longae sessiles; lobus basalis parvus rotundatus 2 mm. diametro; lobus distalis 5–6 mm. stipitatus, late dolabriformis, apice rotundatus; auricula dorsalis parva inflexa. Labellum infundibuliforme, ore circ. 8 mm. latum apice obtusum, cum calcare incurvo gracili

circ. 1.5 cm. longum. Filamenta linearia ; antherae obtusae. Ovarium fusiforme rectum. Fructus deest.

" West China :—In the Mu-li Mountains, S.W. Szechwan, on limestone screes and dry stony pasture. Lat. 28° 12′ N. Alt. 11,000–12,000 ft. Plant of 2–4 inches. Flowers deep orange, spur and base spotted purple. Aug. 1918." G. Forrest. No. 16,792.

A very beautiful dwarf species with very conspicuous flowers much larger than the leaves. I cannot at present suggest the nearest affinity for the plant, which is very different from any *Impatiens* I have seen in the herbaria of Kew, Paris, and Edinburgh.

42470 **Indigofera Howellii,** Craib et W. W. Sm. Sp. nov.

Species ab *I. pendula,* Franch. cui affinis foliis pagina superiore haud glabris floribus minoribus recedit.

Suffrutex ; altitudo non nota ; ramuli pilis medifixis appressis albidis conspersi fusco-brunnei. Folia plerumque 19–23-foliolata, 9–11 cm. longa, petiolo 2–3 cm. longo pilis appressis sparsim induto suffulta ; stipulae circ. 3 mm. longae, anguste lanceolatae acuminatae, fulvido-pilosae ; foliola opposita, plus minusve elliptica, apice rotundata vel nunc paululo truncato-retusa, omnia mucrone vix 1 mm. longo munita, basi cuneato-rotundata, 1.5–2.5 cm. longa, 7–11 mm. lata, in sicco tenuiter papyracea, pagina utraque pilis albidis appressis conspersa, costa infra prominente, nervis lateralibus uti reticulatione gracili subtus tantum subconspicuis ; petioluli circ. 1 mm. longi albido-pilosi ; stipellae inconspicuae. Racemi axillares densi ad 15 cm. longi (in spec. nostris nondum bene evoluti) ; pedunculus 1–2 cm. longus ; bracteae 1 mm. longae lineari-lanceolatae incano-pilosae, cito deciduae ; pedicelli 2 mm. longi ut rhachis pilis et albidis et fulvidis induti. Calyx circ. 3 mm. longus pilis appressis incanis bene indutus ad medium in dentes deltoideos acuminatos divisus. Vexillum 9 mm. longum. circ. 6 mm. latum ; alae circ. 9 mm. longae, 2.5 mm. latae ; carina 8.5 mm. longa.

" West China :—Near Teng-yueh, Yunnan." Howell. No. 15.

" Upper Burma :—Foot of Hpimaw Hill, among light brushwood in boulders by stream. Alt. 6000 ft. Magenta-pink." Farrer. No. 866.

943 **Jasminum dumicolum,** W. W. Sm. Sp. nov.

Species habitu *J. dispermi,* Wall. a quo foliis simplicibus inter alia discriminatur ; ab *J. attenuato,* Roxb. et *J. glanduloso,* Wall. corollae lobis latis obtusis praeter alia signa distinguitur.

Frutex scandens 2–9 m. altus ramulis gracilibus glabris. Folia opposita petiolo circ. 5 mm. longo canaliculato glabro

instructa simplicia; lamina plerumque 9–16 cm. longa, 3–4 cm. lata, anguste lanceolata vel oblongo-lanceolata, apice caudato-acuminata, basi rotundata, in sicco papyracea, supra subnitida, infra pallidior opaco-viridis, utrinque glabra; costa media conspicua nervis utrinque 12 vel pluribus obscurissimis. Inflorescentiae numerosae axillares et terminales, vulgo multiflorae, cymosae, plerumque foliis axillantibus breviores glabrae; bracteae subulatae 2–3 mm. longae glabrae; pedicelli ad 5 mm. longi crassi erecti. Calyx campanulatus circ. 2 mm. longus glaber dentibus quinque 1 mm. longis deltoideis acutis. Corolla intus alba, extra saturate roseo-kermesina, fragrans, tubo 1.5–1.6 cm. longo basi cylindrico 1.5 mm. lato supra expanso ore 5 mm. lato, lobis late ellipticis circ. 7 mm. longis, circ. 5 mm. latis obtusis. Stamina subexsertae antheris latis circ. 5 mm. longis. Stylus inclusus cum stigmate linguiformi circ. 9 mm. longus. Fructus ellipsoideus circ. 9 mm. longus nigrescens.

"West China:—Shweli-Salween divide, Yunnan, on scrub. Lat. 25° 20′ N. Alt. 8000 ft. Scandent shrub of 10–20 ft. Flowers, white interior, exterior deep rose-crimson, fragrant. Feb. 1914." G. Forrest. No. 12,164.

"Hills to the east of Tengyueh, Yunnan, on scrub and trees. Lat. 25° N. Alt. 6000–7000 ft. Scandent shrub of 6–10 ft. Flowers? In fruit. June 1912." G. Forrest. No. 8094.

"Ma-chang-kai Valley, Yunnan, on scrub. Lat. 25° 20′ N. Alt. 6000–7000 ft. Scandent shrub of 6–12 ft. Flowers, interior creamy-white, exterior deep dull crimson. March 1913." G. Forrest. No. 9757.

"Shweli Valley, Yunnan, amongst scrub. Lat. 25° N. Alt. 5000–6000 ft. Shrub of 6–10 ft. In fruit. May 1912." G. Forrest. No. 7926.

"Western flank of the Shweli-Salween divide, Yunnan, on trees and scrub in rather shady situations. Lat. 25° 10′ N. Alt. 8000–9000 ft. Scandent shrub of 10–15 ft. Flowers, exterior deep crimson-rose, interior white or flushed rose, fragrant. Dec. 1912." G. Forrest. No. 9346.

"Ma-chang-kai Valley, north of Tengyueh, on trees. Lat. 25° 20′ N. Alt. 6000 ft. Scandent shrub of 20–30 ft. Flowers, interior white, exterior dull rose, fragrant. Feb. 1913." G. Forrest. Nos. 9531, 15,979.

"Feng chen Lin, S. of Red River, Yunnan, at 7000 ft; large climber, white flowers." Henry. No. 10,634A.

"Mengtsz, S.E. mountain-forests, at 5000 ft; large climber, pinkish flowers." Henry. No. 10,634.

"Szemao, Yunnan, forests to east at 4500 ft; climber, white flowers." Henry. No. 11,708A.

The affinity of this species in spite of the simple leaves is

with *J. dispermum*, Wall. The inflorescences are very similar, but the leaves are very obscurely veined above and below in addition to being simple.

917 **Jasminum heterophyllum,** Roxb., var. **glabricymosum,** W. W. Sm. Var. nov.

A typo inflorescentiis minoribus glabris, calyce glabro recedit.

" West China :—N.W. Yunnan on the Langhong-Hoching divide, on ledges of limestone cliffs. Lat. 26° 16′ N. Alt. 8000 ft. Shrub of 6–8 ft. Flowers deep golden-yellow, fragrant. May 1913." G. Forrest. No. 9990.

" Yungpe Mountains, Yunnan, in open situations by streams. Lat. 26° 45′ N. Alt. 9000 ft. Erect shrub of 6–8 ft. Flowers ? Sept. 1913." G. Forrest. Nos. 11,037 and 11,177.

The same in fruit. Fruits black. Oct. 1913. G. Forrest. No. 11,472.

Mengtsz woods, 5000 ft.; shrub 4 ft.; yellow flowers. Henry. No. 9107B.

Mengtsz woods, 4600 ft.; slender shrubs 4–8 ft.; black fruit. Henry. No. 9107A.

N.W. Yunnan. 1907. Père Monbeig. No. 187.

Lan-ngy-tsin près Lou-lan, Yunnan. May 1904. Pierre Py. No. 487.

931 **Jasminum pulvinatum,** W. W. Sm. Sp. nov.

Species ex affinitate *J. nudifloro*, Lindl. et *J. primulino*, Hemsl. a quibus habitu nano pulvinato inter alia divergit.

Fruticulus densissime intricato-ramosus pulvinatus 30–45 cm. altus, ramis crassis cinerascentibus, ramulis quadrangulis viridibus glabris, saepius apice abscissis defoliatis fere subspinescentibus. Folia opposita, eis *J. nudiflori*, Lindl. subsimilia, trifoliolata, sub anthesi vix evoluta, petiolo 3–4 mm. longo suffulta; foliola 5–7 mm. longa, elliptica vel subobovata, apice obtusa breviter apiculata, basi plus minusve cuneata, membranacea, nisi ad margines minutissime puberulas glabra. Flores numerosi, undique ad superficiem pulvini dispositi, in modum *J. nudiflori* orti. Calyx campanulatus circ. 6 mm. longus, tubo circ. 2 mm. longo, lobis lineari-lanceolatis acutis fere 4 mm. longis glabris. Corolla aureo-flava hypocrateriformis tubo cylindrico circ. 12 mm. longo supra paululo dilatato, lobis plerumque sex 10–11 mm. longis late ellipticis obtusis. Stamina subexserta vel ad medium tubum posita antheris fere 4 mm. longis. Stylus paulo exsertus vel (floribus dimorphis) ad medium tubum attingens stigmate breviter lobato. Fructus deest.

"S.E. Tibet :—Province of Tsarong, on Doker-la, Mekong-Salween divide, in open dry situations on cliffs. Lat. 28° 20′ N. Alt. 9000–10,000 ft. Cushion shrub of 1–1½ ft. Flowers golden-yellow. July 1917." G. Forrest. No. 14,478.

"West China :—Eastern flank of the Bei-ma-shan, Yunnan, on open moorland. Lat. 28° 12′ N. Alt. 14,000–15,000 ft. Stunted almost spinous shrub of 12 inches. Flowers bright yellow. July 1917." G. Forrest. No. 13,834.

This peculiar Jasmine is the alpine equivalent ot *J. nudiflorum*, Lindl. It is characterised by its cushion-habit with dense intricate branching.

003 **Jasminum taliense,** W. W. Sm. Sp. nov.

Species affinis *J. attenuato*, Roxb. et *J. Seguini*, Lévl.; a priore foliis brevioribus paucinervatis inter alia facile dignoscitur; ab altero inflorescentia diffusa multiflora praeter alia signa ex descriptione removitur.

Frutex scandens 2–4 m. altus ramulis gracilibus teretibus glabris rubidis. Folia opposita petiolo 5–10 mm. longo glabro praedita simplicia; lamina 6–8 cm. longa, 3–3.5 cm. lata, elliptica vel ovato-lanceolata, apice acuta vel breviter acuminata, basi rotundata vel late cuneata, membranacea, utrinque nitida, glabra nisi subtus ad axillas nervorum parce tomentellas; nervi 5–6-jugi, plus minusve conspicui, subtus paulo eminentes. Inflorescentiae plerumque terminales, cymosae, multiflorae, ad 10 cm. latae, glabrae, cymulis plerumque trifloris; bracteae subulatae 4–5 mm. longae glabrae; pedicelli ad 5 mm. longi glabri. Calyx campanulatus circ. 3 mm. longus glaber dentibus quatuor 0.5–1 mm. longis triangularibus acutis vel obtusiusculis. Corolla alba, extra roseo-suffusa, tubo 1.5–1.8 cm. longo angusto, lobis plerumque 7 lineari-oblongis 1–1.2 cm. longis acutis. Staminum antherae circ. 3 mm. longae supra medium tubum insertae. Stylus e tubo exsertus stigmate linguiformi praeditus.

"West China :—Western flank ot the Tali Range, Yunnan, on scrub and trees. Lat. 25° 40′ N. Alt. 10,000 ft. Scandent shrub of 6–12 ft. Flowers fragrant, interior creamy-white, exterior flushed carmine. Aug. 1913." G. Forrest. No. 11,667.

"Western flank of the Tali Range, amongst scrub. Lat. 25° 40′ N. Alt. 9000 ft. Semi-scandent shrub of 6–10 ft. Flowers white, flushed rose exterior, fragrant. July 1917." G. Forrest. No. 15,605.

"Szemao, Yunnan, south forests at 5000 ft.; large climber with white flowers." Henry. No. 12,661A.

"Ma chang près Kieou ya pin. Plante cueillie par Paul Ngueou. July 1909." Ducloux. No. 1493.

4410 **Lactuca tsarongensis,** W. W. Sm. Sp. nov.

Species aliquatenus anomala ; habitu nano, capitulo solitario nutante *Cremanthodium* simulante, achaenio vix rostrato bene notata.

Planta 10–30 cm. alta radice elongata sat crassa orta. Caulis gracilis flexuosus glaber. Folia radicalia plerumque 4–6, anguste oblanceolata, 7–10 cm. longa, 1–1.5 cm. lata, apice ambitu rotundata atque abrupte cuspidata vel rarius subacuta, basi in petiolum alatum nunc haud bene discretum attenuata, margine remote et minute denticulata, in sicco membranacea, utrinque glabra, pallido-viridia, costa media conspicua, nervis tenuissimis ; folia caulina 1–4, saepius linearia 1–3 cm. longa, nunc infimum ovatum acuminatum sessile ; suprema sub capitulo nunc fere subulata. Capitula solitaria vel raro 2, nutantia, 2–3 cm. longa et lata ; involucri phylla biseriata vel subtriseriata, ad 1.5 cm. longa, circ. 4 mm. lata, lanceolata, acuta, glabra nisi ad apicem minutissime puberulum, subglauca. Corolla florum ligulatorum circ. 2.2 cm. longa, oblonga, apice 5-dentata, aurantiaca ; pappus circ. 8 mm. longus sordide albus setis simplicibus ; stylus circ. 2 cm. longus ramis stigmatis circ. 2 mm. longis. Achaenia haud matura 2 mm. longa subteretia obscure vel vix costata apice haud rostrata sed paulo angustata glabra.

" S.E. Tibet :—On Doker-la, province of Tsarong, Mekong-Salween divide, on open moist stony pasture. Lat. 28° 20′ N. Alt. 11,000 ft. Plant of 4–12 inches. Flowers deep golden-yellow, fragrant. Aug. 1918." G. Forrest. No. 16,871.

A peculiar species recalling in some respects *Lactuca Dubyaea*, Clarke, but without the glandular hairs of that plant.

Since the above was examined Mr. Reginald Farrer has collected in the Chimili Alps, Northern Burma, a *Lactuca* obviously closely allied and probably a rank-growing form with larger leaves and (in the two specimens) three capitula.

4410' forma **chimiliensis,** W. W. Sm.

Habitu elatiore, caule robusto substricto, foliis majoribus praesertim caulinis, capitulis circ. 3 majoribus a typo differt.

" North Burma :—Chimili Alps in damp alpine meadows and marshes. Alt. 11,500 ft. Aug. 1919." Farrer. No. 1180.

2,19 **Magnolia mollicomata,** W. W. Sm. Sp. nov.

Species ex affinitate *M. obovatae,* Thunb. (*M. hypoleucae,* Sieb. et Zucc.) et *M. officinalis,* Rehder et Wilson a quibus foliis ellipticis apice basique rotundatis infra molliter villosis utrin-

secus circ. 12-nerviis, petiolis densissime cinereo-tomentosis, fructibus anguste cylindricis recedit.

Arbor 18–24 m. alta ; ramuli mediocriter crassi primo dense cinereo-tomentosi, tandem glabrescentes ; gemmae anguste ovoideae dense fulvo- vel cinereo-tomentosae. Folia decidua petiolo 2–4 cm. longo subtereti densissime cinereo-tomentoso praedita ; lamina 16–20 cm. longa, 10–12 cm. lata, elliptica, apice rotundata obscure acuminulata, basi rotundata, membranacea, supra opaco-viridis glabra, infra pallidior molliter cinereo-villosa, ad costam nervosque dense cinereo-tomentosa, nervis utrinsecus 10–12, subtus prominentibus, reticulatione utrinque subconspicua. Flores ignoti. Pedunculus circ. 1.5 cm. longus, crassus, dense fulvo-pilosus ; sepala petalaque ex cicatricibus 12 ; regio staminum circ. 1 cm. longa ; gynophorum nullum. Fructus circ. 14 cm. longus, 2.5–3.5 cm. latus, anguste cylindricus, symmetricus nunc apice paulo contortus ; carpella congesta circ. 12 mm. longa, 8 mm. lata, ad 3 mm. rostrata extra lenticellis magnis notata ; semina 1–2, ovoidea, 10 mm. longa, 7 mm. lata, rubra.

" Western China :—Mekong-Salween divide, Yunnan, in open pine forests. Lat. 28° 12′ N. Alt. 12,000 ft. Tree of 60–80 ft. Flowers pink—seen in flower in 1905, flowering May. July 1917." G. Forrest. No. 14,466.

" Kari Pass, Mekong-Yangtze divide, in open forests. Lat. 27° 40′ N. Alt. 9000 ft. Tree of 50–60 ft. Flowers ? August 1914." G. Forrest. No. 12,915.

" Shweli-Salween divide, Yunnan, in open situations in side valleys. Lat. 25° 40′ N. Alt. 8000–9000 ft. Shrub of 12–20 ft. Flowers ? July 1919." G. Forrest. No. 18,083.

" S.E. Tibet :—Salween—Kiu-chiang divide, Tsarong province, in thickets. Lat. 28° 40′ N. Long. 98° 15′ E. Shrub of 20 ft. Oct. 1919." G. Forrest. No. 18,930. Also Nov. 1919. G. Forrest. No. 18,790.

308 **Magnolia nitida,** W. W. Sm. Sp. nov.

Species affinis *M. Pealianae,* King a qua foliis minoribus glaberrimis utrinque nitidis inter alia recedit ; quoad folia est similis *Micheliae Bodinieri,* Fin. et Gagnep. sed fructu ovoideo haud elongato-spicato praeter signa alia discrepat.

Arbor vel frutex 6–12 m. altus. Rami subgraciles glabri. Folia petiolo 1.5–2 cm. longo glabro supra canaliculato flavo-viridi suffulta ; lamina 7–9 cm. longa, 2.5–4 cm. lata, oblonga vel anguste ovato-oblonga, apice breviter acutata, basi late cuneata vel subrotundata, coriacea, glaberrima, supra nitidissima laete viridis, infra pallidior nitens nervis plerumque 7–10 paribus haud conspicuo eminentibus. Flores desunt. Pedun-

culus sat gracilis, maturitate fructuum glaber ; regio cicatricum staminalium circ. 7 mm. longa glabra ; gynophorum breve adest, 6–8 mm. longum. Carpella matura 15–20 spicam congestam 5–7 cm. longam 2.5–3 cm. latam formantia, 2–2.5 cm. longa, circ. 1 cm. lata, sutura dorsali dehiscentia, seminibus 1–2 laete aurantiaco-rubris ad 12 mm. longis, ad 7 mm. latis aromaticis.

"Western China :—Mekong-Salween divide, Yunnan, in open mixed forests. Lat. 28° 12′ N. Alt. 10,000–11,000 ft. Shrub or tree of 20–40 ft. In fruit, seeds bright orange-red, strongly aromatic. Nov. 1917." G. Forrest. No. 15,059. Also Oct. 1918. G. Forrest. No. 17,300.

This species like *M. Pealiana*, King shows a short gynophore, but the fruit is that of a *Magnolia*. In its leaves it shows an approach to *Michelia Bodinieri*, Fin. et Gagnep.—a species closely allied to *M. Pealiana* in the opinion of its authors.

289 **Magnolia rostrata**, W. W. Sm. Sp. nov.

Species tantum cum *M. officinali*, Rehder et Wilson et *M. obovata*, Thunb. (*M. hypoleuca*, Sieb. et Zucc.) comparabilis a quibus fructu anguste cylindrico e carpellis parvis longirostratis composito inter alia signa discrepat.

Arbor 12–24 m. alta ; ramuli annotini glabri flavido-cinerei, vetustiores cicatricibus magnis foliorum delapsorum suborbicularibus notati ; gemmae circ. 5 cm. longae, anguste cylindricae, acutatae, glabrae, eis *M. Delavayi*, Franch. simillimae. Folia decidua, ad apicem ramulorum congesta petiolo ad 4 cm. longo cito glabrescente suffulta ; lamina ad 32 cm. longa, ad 23 cm. lata, late obovata, apice latissima rotundata, acumine plerumque obsoleto, basim versus angustata et rotundata, in sicco tenuiter papyracea, supra laete viridis maturitate glabra, infra glauca vel subglauca, ad costam nervosque densiuscule fulvo- vel ferrugineo-pilosa, cetera hic illic sparsim pilosula, nervis utrinsecus plus minusve 30 cum costa elevatis, reticulatione nervulorum utrinque conspicua. Flores praecoces, rosei, cupuliformes, saltem 16 cm. diametro ; pedunculi crassi, circ. 2 cm. longi, sub anthesi ut videtur glabri ; sepala petalaque 10–11, circ. 7–8 vel nunc 10 cm. longa, 3–5.5 cm. lata, subaequalia, obovata. Stamina numerosa, filamentis ad 5 mm. longis, antheris circ. 1 cm. longis mucrone brevi triangulari praeditis. Carpella pernumerosa stylis ovaria subaequantibus. Fructus cylindricus, 12–14 cm. longus, ad 4 cm. latus, apice paulo angustatus, basi subrotundatus, carpellis infimis haud decurrentibus ; carpella inter minora, sub dehiscentiam circ. 1 cm. longa, 5–6 mm. lata, naviculiformia, 1–2-sperma, rostro

valido supra incurvo 6–8 mm. longo coronata; semina multo compressa, circ. 7 mm. longa, 5 mm. lata.

"Western China:—Mekong-Salween divide, Yunnan, in open mixed forests. Lat. 28° 12′ N. Alt. 11,000–12,000 ft. Tree of 60–70 ft. Flowers? Said to be large, white flushed rose? In fruit. Nov. 1917." G. Forrest. No. 15,052. Also Oct. 1918. In fruit. G. Forrest. No. 17,301.

"Sie-la Pass, Mekong-Salween divide, Yunnan, in mixed forest. Lat. 28° N. Alt. 10,000–11,000 ft. Tree of 40–80 ft. Flowers rose-pink, fleshy. May 1918." G. Forrest. No. 16,403.

Since the above description was written I have had the advantage of going over the material with Mr. Forrest. The flowers of No. 16,403 are somewhat imperfect as they were withering when collected. Mr. Forrest is quite clear that certain other specimens of a precocious *Magnolia* are referable to this species. In its flowering state this *Magnolia* has a striking resemblance to *M. Campbellii*, Hook. f. et Thoms. The fruits however are very distinct.

The following are conspecific:—

"Shweli-Salween divide, Yunnan, in mixed and pine forests. Lat. 25° 30′ N. Alt. 10,000 ft. Tree of 60–80 ft. Flowers precocious, bright rose-pink. April 1913." G. Forrest. No. 11,860.

"Mekong-Salween divide, Yunnan, in open situations. Lat. 28° N. Alt. 7000 ft. Shrub of 20 ft. Flowers fragrant, fleshy, creamy-yellow. April 1918." G. Forrest. No. 16,388.

"S.E. Tibet:—Mekong-Salween divide, in pine and mixed forests. Lat. 28° 15′ N. Alt. 10,000–11,000 ft. Tree of 30–60 ft. Flowers rose-pink. Flowers appearing before the foliage. June 1904." G. Forrest, No. 140. Recorded in Notes R.B.G., vii (1912), 15, as *M. conspicua*, Salisb.

"N.W. Yunnan. 1907." Monbeig, No. 11.

"Eastern flank of the N'Maikha-Salween divide, Yunnan, in mixed thickets and forests. Lat. 26° 20′ N. Alt. 8000–9000 ft. Shrub or tree of 30–40 ft. Flowers creamy-white, flushed purplish exterior, fragrant. May 1919." G. Forrest. No. 17,868.

"N'Maikha-Salween divide. Lat. 26° 30′. Tree of 60–80 ft. June 1919." G. Forrest. No. 18,246.

"Upper Burma:—High glens above Hpimaw, 9,000–10,000 ft. Abounds in the higher jungle glades going up to Hpimaw Pass and down on the other side, in China. No two trees seem to bear flowers of the same shade and the pure whites are even more beautiful than the rest. Beginning to pass over by April

11th, though still superb. April 11th, 1919." R. Farrer. No. 816.

This is the plant which Mr. Farrer judged to be closely akin to *M. Campbellii*, Hook. f. et Thoms.

"N.E. Upper Burma. Nov. 1919." G. Forrest. No. 18,751.

291 **Magnolia tsarongensis,** W. W. Sm. et G. Forrest. Sp. nov.

Species affinis *M. mollicomatae,* W. W. Sm. supra descriptae a qua ramis hornotinis dense ferrugineo-tomentosis, foliis subtus ferrugineo-tomentosis, stipulis diu persistentibus, fructibus multo minoribus praeter alia signa removitur.

Frutex ex collectore 3–6 m. altus ; ramuli mediocriter crassi primum densissime ferrugineo-tomentosi tarde glabrescentes ; gemmae 2–3 cm. longae anguste oblongae ferrugineo-tomentosae. Folia decidua petiolo 3–8 cm. longo supra canaliculato dense ferrugineo-tomentoso suffulta ; lamina majorum 17–23 cm. longa, 7–12 cm. lata, elliptica, apice ambitu rotundata breviter apiculata, basi rotundata vel nunc cordatula, in sicco membranacea, supra atroviridis ad costam nervosque ferrugineo-tomentella, ceterum primum pilis ferrugineis conspersa, mox glabrescens, infra ad costam nervosque eminentes dense ferrugineo-tomentosa ceterum pilis subferrugineis bene conspersa tempore fructus vix glabrescens ; nervi utrinque circ. 12 ; stipulae diu persistentes 4–7 cm. longae, circ. 8 mm. latae, oblongae, convolutae, primo ad petiolum arcte adpressae, dense ferrugineo-tomentosae. Flores cum foliis coetanei ad 6.5 cm. longi flavido-albi fragrantes ; pedunculus ad 6 cm. longus, 2–3 mm. crassus, dense fulvido-tomentosus ; bracteae deciduae pars superstes glabra vel basi pilosa extra verruculosa in sicco nigricans. Sepala petalaque in flore dissecto 8, subaequalia, plus minusve elliptica, utrinque rotundata, medio circ. 3.5 cm. lata. Stamina numerosa, filamentis paulo dilatatis 2–3 mm. longis, antheris 11–12 mm. longis apice retusis connectivo mucronato haud praeditis. Gynaeceum cum parte staminifera 2.5 cm. paulo superans, medio vix 1 cm. latum, glabrum, carpellis numerosis stigmatibus circ. 4 mm. longis acutis paulo recurvis. Fructus circ. 6 cm. longus, 2 cm. latus, symmetricus, oblongus, carpellis 1 cm. paulo excedentibus circ. 30 bene rostratis, seminibus delapsis.

"S.E. Tibet :—Salween-Taron (Kiu-Chiang) divide, Yunnan, in thickets and on the margins of thickets. Lat. 28° 40′ N. Alt.? Shrub of 10–20 ft. Flowers fragrant, creamy-white. July 1919." G. Forrest. Nos. 18,870, 18,512.

"Salween—Kiu-Chiang divide. Lat. 28° 40′ N. Long. 98° 15′ E. Oct. 1919." G. Forrest. No. 18,959 (duplicate in fruit of No. 18,870).

48! **Michelia Lacei,** W. W. Sm. Sp. nov.

Species fructu magno circ. 4 cm. longo bene notata; *M. manipurensi,* Watt affinis.

Arbor mediocris. Rami crassi glabri lenticellis suborbicularibus ornati. Folia petiolo 2–2.5 cm. longo glabro supra canaliculato suffulta; lamina 14–19 cm. longa, 6.5–8 cm. lata, oblongo-elliptica, apice ambitu subrotundata breviter acutata, basi late cuneata vel subrotundata, in sicco tenuiter coriacea, texturā *M. manipurensis* ei similis, maturitate utrinque glabra, nervis lateralibus 12–15 paribus infra marginem arcuatis cum nervulis conspicuo reticulatis. Flores non visi. Pedunculus crassus circ. 1.5 cm. longus; regio cicatricum staminalium circ. 1.5 cm. longa; gynophorum in fructu ad 3 cm. longum glabrum. Carpella matura in specimine nostro 12, pro genere permagna, ad 1 cm. stipitata; circ. 4 cm. longa, 2–2.5 cm. lata, lignosissima, muro 5–8 mm. lato, extra glabra lenticellis orbicularibus bene conspersa; semina in quoque carpello plerumque sex matura, circ. 7 mm. longa, 5 mm. lata, rubra.

"Upper Burma:—Thondaung to Aui Sakan, near Maymyo; alt. 3000 ft. Aug. 1912." J. H. Lace. No. 5928.

Closely allied to *Michelia manipurensis,* Watt, this species has a remarkably large fruit, the individual carpels containing six ripe seeds and evidence that the ovules were at least twelve in number.

44340 **Mucuna calophylla,** W. W. Sm. Sp. nov.

Species affinis *M. montanae,* Diels a qua foliolis longe acuminatis subtus pulchre et dense sericeis facile distinguenda est.

Planta debilis scandens ad 1 m. alta. Caules gracillimi primo setis fulvidis conspersi, mox glabri vel subglabri. Folia petiolo 4–7.5 cm. longo setulis consperso glabrescente suffulta; petioluli laterales circ. 5 mm. longi dense fulvido- vel ferrugineo-setosi; petiolulus intermedius ad 2 cm. longus; foliola subaequalia plerumque circ. 7 cm. longa, circ. 3 cm. lata, supra atroviridia setis fulvidis vel subferrugineis appressis primo dense tandem sparsim induta, infra dense molliterque sericeo-tomentosa, intermedium subsymmetricum late lanceolatum apice caudato-acuminatum, basi rotundatum, lateralia basi valde asymmetrica ceteroquin intermedio subsimilia; nervi 3–4 paria. Flores in speciminibus sejuncti. Calyx circ. 12 mm. longus fere ad medium fissus, cano-tomentosus atque ferrugineo-setosulus; lobi superi lanceolati 5–6 mm. longi, inferus late triangularis. Corolla atro-kermesina; vexillum suborbiculare circ. 2 cm. longum, 1.8 cm. latum; alae circ. 2.8 cm. longae, basi ciliatae; carina circ. 3.5 cm. longa. Fructus deest.

"West China :—Western flank of the Tali Range, on dry grassy slopes. Lat. 28° 40′ N. Alt. 9000 ft. Scandent plant of 2–3 ft. Flowers deep crimson-maroon. July 1917." G. Forrest. No. 15,619.

13029 **Ophiorrhiza umbricola,** W. W. Sm. Sp. nov.

Species ex affinitate *O. Griffithii,* Hook. f. a qua bracteolis lanceolatis vel oblongo-lanceolatis, corollis majoribus pallide carmineis praeter alia signa recognoscitur.

Planta 20–45 cm. alta basi decumbens caulibus glabris vel fere glabris. Folia petiolo circ. 2 cm. longo glabro munita; lamina majorum 9–13 cm. longa, 3–5 cm. lata, lanceolata vel subelliptica, longe acuminata, basi cuneata, tenuiter membranacea, utrinque glabra vel setulis hic illic pagina superiore conspersa, supra atroviridis, infra multo pallidior, costa nervisque subtus conspicuis; stipulae inconspicuae. Cymae terminales pauciflorae pedunculo ad 3 cm. longo glabro suffultae; ramuli glabri vel minutissime fulvido-puberuli; pedicelli vix 1.5 mm. superantes; bracteolae 5–6 mm. longae lanceolatae vel oblongo-lanceolatae, obtusae, glabrae, costa conspicua pererratae. Calycis tubus circ. 2 mm. longus costatus sparsim et minutissime puberulus dentibus minutis deltoideis. Corolla circ. 2.5 cm. longa pallide carminea extra glabra intus villosa lobis ovatis obtusiusculis circ. 6 mm. longis. Discus conspicuus bilobus in sicco carmineo-suffusus. Fructus deest.

"Upper Burma :—Nwai Valley, on shady banks in forest amongst undergrowth. Alt. 7000–8000 ft. Flowers deep pink. Sept. 1914." F. K. Ward. No. 1944.

"West China :—Shweli-Salween divide, Yunnan, on trees and boulders, in shady mixed forests. Lat. 25° 12′ N. Alt. 8000 ft. Plant of 9–18 inches. Flowers pale carmine, drying a deeper shade. June 1918." G. Forrest. No. 17,656.

5218 **Parrya xerophyta,** W. W. Sm. Sp. nov.

Species valde affinis *P. linearifoliae,* W. W. Sm. a qua caulibus elatioribus miro modo foliis semi-emarcidis onustis, foliis glabris vel subglabris, fructibus oblongis tantum ad margines (et parcissime) pilosis recedere videtur.

Planta quoad folia et flores *P. linearifoliae* simillima sed habitu longe divergit. Pars epigaea ad 15–20 cm. attingens foliis annorum plurium semimarcidis induta. Folia linearia glabra vel subglabra; pars apicalis mox emarcida et cito decidua, pars basalis persistens rigida incrassata straminea, glabra vel hic illic capillis longis albidis conspersa. Inflorescentiae ut in *P. linearifolia*; calyx pedicellusque multo minus pilosi; corolla

pallido-rosea. Ovarium glabrum. Fructus ex speciminibus haud bonis anguste oblongus 4–5 mm. latus ad margines parcissime pilosus.

" West China :—Mountains N.E. of Chungtien, Yunnan, on ledges and in crevices of dry cliffs. Lat. 27° 55′ N. Alt. 14,000 ft. Cushion plant of 6–8 inches height and somewhat greater diameter. Flowers pale rose. July 1918." G. Forrest. No. 16,444.

This is a plant of very remarkable habit. The stems are densely clothed with the persistent and hardened lower halves of the leaves. Notwithstanding the striking habit, the plant approximates closely to *P. linearifolia*, W. W. Sm., but is much more glabrous while the fruits are very narrow oblong.

7440 **Plectranthus muliensis,** W. W. Sm. Sp. nov.

Species quoad inflorescentiam *P. phyllostachydi,* Diels affinis a quo foliis longe petiolatis haud subsessilibus differt ; ut in illa specie inflorescentia bracteis conspicuis ornata est.

Planta suffruticosa ad 1 m. alta ramosa caulibus dense cinereo-tomentosis. Folia petiolo ad 2.5 cm. longo albo-tomentoso praedita ; lamina foliorum medianorum ad 9 cm. longa, ad 5.5 cm. lata, ovata, apice plus minusve acuminata, basi breviter et subabrupte in petiolum angustata, margine bene crenato-dentata, papyracea, supra rugosula glabra nisi ad costam nervosque pilis albidis parvis conspicuos, infra pilis simplicibus mollibus incano-tomentella, praesertim ad nervos. Inflorescentiae elongatae angustae terminales et in axillis superioribus ortae, paniculam terminalem formantes ; flores in verticillastros 6–8-floros fere continuos compositi ; bracteae conspicuissimae, inferiores latissime obovatae atque longiuscule cuspidatae, saepe 2 cm. longae, 1.5 cm. latae, foliaceae et ut folia indutae, supra decrescentes, superiores lanceolatae vel ovato-lanceolatae, acuminatae vulgo circ. 1 cm. longae, 4 mm. latae, etiam ad apicem inflorescentiae verticillastros superantes vel saltem aequantes. Flores 5–6 mm. longi ; pedicelli circ. 3 mm. longi pilosuli. Calyx circ. 3.5 mm. longus campanulatus sparsim pilosulus dentibus triangularibus acutis tubum aequantibus albociliatis. Corolla basi gibbosa roseo-purpurea, circ. 5 mm. longa ; tubus labiis paulo longior ; labium inferius breviter quadrilobum. Stamina inclusa.

" West China :—Mu-li Mountains, S.W. Szechwan, on the margins of thickets. Lat. 28° 12′ N. Alt. 10,000 ft. Shrubby plant of 2–3 ft. Flowers creamy-white, flushed and marked rose-purple. Sept. 1918." G. Forrest. No. 17,000.

In the conspicuous bracts this species recalls *P. phyllostachys,* Diels, which has however sessile leaves. In size and form of

flower it is near *P. Coetsa*, Ham., but differs from it in leaves and form of inflorescence, including the bracts.

115 **Podocarpus Forrestii,** Craib et W. W. Sm. Sp. nov.

Species affinis *P. macrophyllo* (Thunb.), Don a qua habitu humiliore, foliis brevioribus atque latioribus apice obtusis vel etiam rotundatis inter alia recedit.

Frutex 1–3 m. altus ; ramuli sat robusti rigidi crebre foliati. Folia cum petiolo 5–8 cm. longa, 9–13 mm. lata, anguste oblonga vel oblongo-lanceolata, apice obtusissima vel subrotundata, nonnunquam subapiculata costa media paululo projecta, basi in petiolum alatum atque vix discretum circ. 2 mm. longum sensim attenuata, margine incrassata, in sicco coriacea, supra subglauco-viridia vel opaco-viridia, infra pallidiora glaucescentia ; costa media subtus latiuscula prominula. Flores masculi desunt. Flores feminei singuli ; pedunculus circ. 8 mm. longus ; receptaculum carnosum, glauco-coeruleum, circ. 3 mm. longum, basi foliolis 2 linearibus circ. 2 mm. longis munitum. Fructus maturus deest.

Podocarpus macrophyllus, Diels vix Don in Notes R.B.G. Edin., vii (1912), 258.

" West China :—Eastern flank of the Tali Range, Yunnan, in shady situations amongst scrub. Lat. 25° 40′ N. Alt. 8000–10,000 ft. Shrub of 2–5 ft. Flowers green. Aug. 1906." G. Forrest. No. 4665.

Also Aug. 1910. G. Forrest. No. 6852.

" Western flank of the Tali Shan, in open thickets. Lat. 25° 40′ N. Alt. 10,000 ft. Shrub of 4–9 ft. Aug. 1917." G. Forrest. No. 15,527.

This new species is closely akin to the variety *maki*, Sieb. of *P. macrophyllus* (Thunb.), Don, differing chiefly in the form, colour, and consistence of the leaves. Delavay No. 4026, referred by Franchet to *macrophyllus*, is probably this plant.

2185 **Premna scoriarum,** W. W. Sm. Sp. nov.

Species ex affinitate *P. latifoliae*, Roxb. a qua foliis glaberrimis, calyce 4-dentato inter alia distinguitur.

Frutex 1–2 m. altus. Rami hornotini sat robusti nigridi glabri, annotini cinerei. Folia petiolo circ. 2 cm. longo glabro praedita ; lamina foliorum majorum 15–21 cm. longa, 7–10 cm. lata, ovato-lanceolata vel oblongo-lanceolata vel subelliptica, apice caudato-acuminata, basi plus minusve rotundata, margine integra nunc paulo undulata, in sicco papyracea, utrinque glabra, supra atroviridis, infra pallidior, nervis circ. 6 paribus, reticulatione utraque pagina bene conspicua. Inflorescentiae late paniculatae ad 14 cm. latae, ad 8 cm. altae ; axes dense et

minute fulvido-pilosi ; bracteae lineari-lanceolatae circ. 5 mm. longae pilosae ; pedicelli brevissimi. Calyx circ. 1 mm. longus campanulatus extra minute pilosulus in lobos 4 subaequales ovatos apice rotundatos fere ad medium divisus. Corolla 2 mm. paulo superans ad medium in lobos oblongos obtusos subaequales divisa viridi-alba faucibus pilosa. Stamina 4. Fructus deest.

"West China :—Lava-bed west of Teng-yueh, Yunnan. Lat. 25° N. Alt. 5000 ft. Shrub of 3–6 ft. Flowers greenish-white. May 1912." G. Forrest. No. 7488.

"On lava-bed west of Teng-yueh, Yunnan, in open situations. Lat. 25° N. Alt. 5000 ft. Shrub of 2–4 ft. Flowers yellowish-green. May 1912." G. Forrest. No. 7629.

6775 **Reineckia yunnanensis,** W. W. Sm. Sp. nov.

Species *R. carneae*, Kunth valde affinis ; spica laxiuscula, flore albo, antheris caeruleis nec flavis, fructu saltem 6-spermo differt.

Planta acaulis foliis 15–20 cm. longis. Habitus foliaque *R. carneae*, Kunth. Spica in speciminibus nostris 2–3-flora laxiflora. Flores albi fragrantes ; bracteae circ. 5 mm. longae membranaceae late ovatae. Perianthii segmenta sex lanceolata vel lanceolato-oblonga, circ. 12 mm. longa, 4 mm. lata in tubum circ. 5 mm. longum connata, obtusa, recurva. Stamina ad fauces tubi inserta filamentis circ. 4 mm. longis, antheris caeruleis 2.5 mm. longis. Stylus stamina paululo superans ; ovarium superum. Fructus (in sicco compressus) 1 cm. diametro vel paulo ultro seminibus sex ovoideis 4 mm. longis.

"Western China :—Western flank of the Shweli-Salween divide, Yunnan, in open dry situations in pine forests. Lat. 25° 20′ N. Alt. 9000–10,000 ft. Plant of 6 inches. Flowers white, fragrant, anthers blue. Aug. 1912." G. Forrest. No. 9010.

"Western flank of the Shweli-Salween divide, on rocks and ledges of cliffs. Lat. 25° 20′ N. Alt. 8000–9000 ft. Plant of 6–9 inches. Flowers white. Aug. 1912." G. Forrest. No. 9150.

44012 **Saussurea trullifolia,** W. W. Sm. Sp. nov.

Species sectionis *Eriocoryne*, Hook. fil. et affinis *S. gossypiphorae*, Don ; foliis perlate obovatis facile recognoscitur.

Caudex crassus foliorum vestigiis dense obsitus ; radix longa fusiformis. Caulis 8–9 cm. altus arachnoideo-lanuginosus dense foliatus. Folia petiolo ad 2.5 cm. longo latiusculo arachnoideo-lanuginoso praedita ; lamina circ. 3 cm. longa, 2.5 cm. lata, late

obovata, apice ambitu rotundata, basi in petiolum subsensim attenuata, margine in dimidio superiore dentata, dentibus sat magnis 8–12, crasse papyracea, utrinque albo-lanuginosa, nervis obscuris. Capitula numerosa in glebam circ. 5 cm. diametro congesta e foliis semiprotrusa ; involucri phylla exteriora circ. 2.5 cm. longa, 5 mm. lata, lineari-lanceolata, longe acuminata, capillis longis albis vel fulvidis articulatis dense lanuginosa, interiora circ. 1 cm. longa, 2–3 mm. lata, oblanceolata vel obovata, straminea marginibus hyalino-scariosis, nitentia glabra apice sparsim pilosulo excepto. Corolla circ. 1.2 cm. longa ; pappus plumosus 1 cm. longus albidus ; setae exteriores paucae. Achenium immaturum glabrum.

" West China :—At A-tun-tsu, N.W. Yunnan, on screes at 15,000–16,000 ft. Aug. 1913." F. Kingdon Ward. No. 1016.

4403 **Saussurea velutina**, W. W. Sm. Sp. nov.

Species affinis *S. uniflorae*, Wall. a qua sociisque foliis dense et mollissime tomentosis inter alia differt.

Planta erecta 30–35 cm. alta caule simplici robusto laxe albido-piloso basi glabrescente. Folia radicalia delapsa ; caulina 6–12, suberecta, 8–14 cm. longa, 1–1.5 cm. lata, lineari-lanceolata vel sublinearia, apice acuminata indurato-apiculata, basi in partem petiolarem vix discretam semiamplexicaulem attenuata, margine remote et minute serrulata, utrinque molliter fulvido-tomentosa, nervis celatis, costa media tantum visibili ; folia involucrantia 3–4 cm. longa, capitulum semi-includentia, obovata vel subelliptica, remote serrata vel subintegra, breviter acumi-nata, purpurea, laxe albido-pilosa. Capitulum solitarium 3–4 cm. diametro pedunculo brevi crasso suffultum ; involucri phylla circ. 1.5 cm. longa anguste lanceolata, acuminata, plus minusve albido-villosa, exteriora utraque facie nigrida, interiora straminea marginibus nigris. Corolla 1.5 cm. longa pappo interiore circ. 1 cm. longo sordide albo, setis exterioribus 4–5 mm. longis scabridulis, acheniis vix maturis oblongis circ. 3 mm. longis atrobrunneis glabris.

" West China :—On the Bei-ma-shan, N.W. Yunnan, on screes at 16,000 ft. 1913." F. Kingdon Ward. No. 1093.

4123 **Schefflera (Heptapleurum) dumicola**, W. W. Sm. Sp. nov.

Species affinis *S. salweenensi*, W. W. Sm. et *S. shweliensi*, W. W. Sm. a quibus foliolorum oblongorum subtus glaucorum forma atque textura inter alia differt.

Frutex 4–6 m. altus. Folia superiora tantum visa petiolo 15–40 cm. longo glabro suffulta ; foliola 5–9, petiolulis 1.5–4.5 cm. longis praedita ; lamina 15–24 cm. longa, 4–5 cm. lata,

oblonga, apice plus minusve acuminata, basi cuneata, margine integra, textura tenuis sub fructu papyracea, glabra, supra atroviridis, infra pulchre glauca, nervis utrinque 12–20 haud eminentibus. Panicula fructifera angusta ad 40 cm. longa, basi ad 15 cm. nuda, racemiformis, infra medioque ramulos patentes circ. 4 cm. longos emittens ; rhachis stellato-tomentella ; flores non visi. Fructus subglobosus circ. 5 mm. diametro purpureo-niger 5-locularis ; styli in unum coaliti ; stigmata paulo divergentia.

"West China :—Shweli-Salween divide, Yunnan, in scrub and on the margins of mixed forests. Lat. 25° 20′ N. Alt. 8000 ft. Shrub of 12–20 ft. In fruit ; fruits purple-black. February 1918." G. Forrest. No. 16,158.

The following is probably identical :—

"Western flank of the Tali Range, Yunnan, in open scrub in side valleys. Shrub of 12–20 ft. Foliage only. Lat. 25° 40′ N. Alt. 9000 ft. Aug. 1913." G. Forrest. No. 11,665.

5794 **Scutellaria tenax,** W. W. Sm. Sp. nov.

Species affinis *S. Franchetianae,* Lévl. a qua habitu subdecumbente, racemis terminalibus, foliis multo minoribus floribus coeruleis basi flavidis inter alia signa divergit.

Planta subfruticosa ad 30 cm. alta, caulibus pluribus flexuosis saepe decumbentibus tenacibus basi longe nudis dense cinereo-pilosis. Folia petiolo circ. 2 mm. longo pilosulo praedita ; lamina 1–2 cm. longa, 1–2 cm. lata, hederiformis, apice obtusa, basi rotundata, margine dentibus magnis utrinque vulgo 2 notata, papyracea, supra pilis appressis conspersa, infra paulo densius. Inflorescentiae terminales vel nonnunquam axillares pauciflorae et laxiflorae ; bracteae inferiores foliis subsimiles sed minores, superiores 3–4 mm. longae ovatae vel ovato-lanceolatae integrae obtusae ; axis dense glanduloso-pilosus. Flores in paria dispositi, quoad formam atque magnitudinem eis *S. discoloris,* Colebr. subsimiles, ad 4 mm. pedicellati. Calyx 2.5 mm. longus dense glanduloso-pilosus. Corolla 12–13 mm. longa, extra pilis glandulosis bene praedita, opaco-coerulea, basi flavida, tubo latiusculo, lobo labii inferioris intermedio tubum fere aequante. Stamina ad apicem loborum fere attingentia. Fructus deest.

"West China :—Mountains of the Chungtien plateau, Yunnan, on open dry pasture. Lat. 27° 40′ N. Alt. 10,000 ft. Half-shrubby plant of 1 ft. Flowers dull blue, tube of corolla yellow at base. Aug. 1914." G. Forrest. No. 13,050.

A very distinct plant with its wiry flexuous stems and small hederiform leaves.

144' **Sideroxylon shweliense,** W. W. Sm. Sp. nov.

Species affinis *S. burmanico,* Coll. et Hemsl. a quo foliis anguste lanceolatis recedit ; a *S. Wightiano,* Hook. et Arn. floribus majoribus differt.

Frutex 1–2 m. altus. Ramuli annotini cinerei glabri. Folia alterna petiolo 6–8 mm. longo primum minute cinereo-adpresso-pilosulo demum glabrescente praedita ; lamina 7–8 cm. longa, circ. 2.5 cm. lata, anguste lanceolata, apice longiuscule acutata, acumine ipso obtusiusculo, basi cuneata, in sicco papyracea, supra laete viridis nitens glabra nisi ad costam sparsim pilosulam, infra pallidior glabra vel sparsissime (praesertim ad costam) pilosula. Flores 1–4-fasciculati in axillis foliorum delapsorum, pedicellis 3–4 mm. longis fulvo-tomentosis suffulti. Calycis segmenta 3–4 mm. longa valde imbricata inaequalia late ovata obtusissima extra fulvo-tomentosa intus in parte superiore pilosula. Corolla flavida circ. 8 mm. longa extra glabra vel subglabra intus ad tubum pilosula lobis ovato-lanceolatis acutis circ. 5 mm. longis. Stamina 5 filamentis 1.5 mm. longis glabris antheris 2.5 mm. longis ; staminodia 5 lanceolata acuta lobos corollae subaequantia paulo fimbriata. Stylus glaber cum ovario tomentoso 5-loculari circ. 11 mm. longus. Fructus circ. 3 cm. longus ovoideus.

"Western China :—In mixed forests in ravines on the western flank of the Shweli-Salween divide, Yunnan. Lat. 25° 40′ N. Alt. 9000–10,000 ft. Shrub of 4–6 ft. Flowers creamy-yellow. May 1919." G. Forrest. No. 17,886.

"Sept. 1919. In fruit." G. Forrest. No. 18,555.

3650 **Silene sinowatsoni,** W. W. Sm. Sp. nov.

Species habitu *S. rosiflorae,* F. K. Ward affinis sed floribus remota ; ob structuram floris in vicinitatem *S. yunnanensis,* Franch. posita est sed notis multis differt.

Planta in cultura plus minusve decumbens basi ramosus caulibus ad 30 cm. longis flexuosis remotiuscule foliosis capillis albis patentibus glandulosis bene indutis. Folia sessilia, ad 4.5 cm. longa, ad 2 cm. lata, ovata vel ovato-lanceolata, apice acuta vel subacuta, basi rotundata, tenuiter papyracea, utraque facie et ad marginem pilis albidis glandulosis bene instructa. Inflorescentiae terminales laxissime cymosae pauciflorae ramis dense albo-glanduloso-pilosis ; pedicelli seniores 3–5 cm. longi glanduloso-pilosi ; bracteae foliosae circ. 1 cm. longae glandulosae. Calyx 16–17 mm. longus, circ. 6 mm. latus, tubulosus, basi vix angustatus, dentibus lineari-lanceolatis acuminatis circ. 5 mm. longis, roseo-purpureus, ad nervos 10 purpureos pilis glandulosis bene praeditus. Petala calycem fere duplo superantia,

rosea, ungue glabro supra paululo dilatato exauriculato circ. 1.6 cm. longo in laminam obovatam circ. 1.3 cm. longam ad medium quadrifidam expanso, lobis interioribus oblongis erosulis exterioribus linearibus minoribus; squamae oblongae vel sublineares circ. 2 mm. longae incisae vel integrae. Staminum filamenta glabra. Ovarium anguste oblongum uniloculare basi parietum vestigiis instructum stylophoro duplo longius, stylis tribus coronatum. Capsula matura deest.

Central China:—Cultivated in the Royal Botanic Garden from seeds sent by Mr Charles Marson Watson.

4141 **Strobilanthes shweliensis,** W. W. Sm. Sp. nov.

Species affinis *S. multidenti,* Clarke et *S. rhombifolio,* Clarke; a priore foliis basi rotundatis, flore fere dimidio minore inter alia divergit; ab altera caule viscoso-pilosulo, foliis scabridulis majoribus, flore minore praeter alia signa removitur; a *S. scoriarum* autem affini calycibus viscoso-pubescentibus differt.

Planta circ. 1 m. alta erecta caulibus subquadratis primo dense viscoso-pilosulis tandem glabrescentibus. Folia superiora ad regionem inflorescentiae sessilia, inferiora petiolo 1–2 cm. longo subglabro suffulta; lamina majorum 12–15 cm. longa, circ. 7 cm. lata, ovata vel ovato-lanceolata, apice acuminata, basi plus minusve rotundata, margine crebre et regulariter serrulata, serraturis utrinque circ. 50, in sicco submembranacea, tactu utrinque scabridula, lineolata, inter dentes sparsim ciliolata; nervi ad 10 paria. Inflorescentiae amplae anguste paniculatae ad 30 cm. longae; rhachis cum ramis ramulisque dense glanduloso-pilosa; bracteae sub anthesi deciduae. Calyx circ. 1 cm. longus pilis longis glandulosis dense indutus, in lobos 5 lineares fere ad imum divisus. Corolla 2.5–3 cm. longa fere recta extra glabra purpurea, intus glabra (nisi ad unum locum apud fauces albo-villosum); tubus infra cylindricus supra subito ampliatus, parte ventricosa paulo longiore, lobis rotundatis circ. 5 mm. diametro. Stamina 4 filamentis glabris, polline typico. Ovarium minute pilosulum stylo gracillimo in parte inferiore sparsim pilosulo. Fructus deest.

"West China:—Shweli-Salween divide, Yunnan, in open situations by streams. Alt. 10,000 ft. Lat. 25° 20′ N. Plant of 3–4 ft. Flowers ruddy purple. Sept. 1917." G. Forrest. No. 16,107.

4142 **Thunbergia salweenensis,** W. W. Sm. Sp. nov.

Species valde affinis *T. maculatae,* Lace a qua floribus kermesinis, calyce longiuscule denticulato glabro inter alia divergit.

Planta scandens ad 1–5 m. attingens. Caules herbacei, glabri vel subglabri nisi ad nodos ubi pilorum albidorum subsetaceorum

linea circumdati. Folia petiolo 2–2.5 cm. longo praedita, plerumque circ. 7–10 cm. longa, 4–5 cm. lata, ovata, apice plus minusve acuminata, basi subrotundata et subabrupte in petiolum supra paulo alatum angustata, obscure et distanter denticulata vel subintegra, in sicco membranacea, supra pilis subsetaceis conspersa, infra pallidiora glabra, nervis utrinque 3–4 in sicco conspicuis. Flores axillares, solitarii, pedicellis 5–7 cm. longis glabris praediti ; bracteolae eis *T. maculatae* simillimae. Calyx irregulariter et prominenter denticulatus, sed vix ita conspicuo ut in sectione *Euthunbergia*, glaber. Corolla circ. 4.5 cm. longa ex collectore kermesina, immaculata, extra glabra intus minute pilosula, lobis subaequalibus rotundatis. Stamina inclusa filamentis apice glabris infra pilosis et glandulosis ; antherae acuminatae circ. 6 mm. longae, acumine 2 mm. longo longe piloso atque basi appendicula 2 mm. longa oblonga pilosa praeditae. Discus mediocris carnosus. Ovarium glabrum stylo 2.7 cm. longo glabro apice obscure bilobulato munitum. Fructus deest.

" West China :—Salween Valley, Yunnan, on scrub. Lat. 25° 10′ N. Alt. 3000 ft. Scandent plant of 4–5 ft. Flowers deep crimson. Aug. 1914." G. Forrest. No. 13,158.

" Shweli-Salween divide, Yunnan, on scrub in thickets. Lat. 25° 30′ N. Alt. 7000–8000 ft. Scandent plant of 10–15 ft. Flowers red. July–Aug. 1918." G. Forrest. No. 17,645.

This Yunnan species is very like *T. maculata*, Lace from the Ruby Mines District of Burma. The leaves, bracteoles, and the structure of the flower, especially the stamens, are very similar. The Yunnan plant differs chiefly in the crimson or red flowers (instead of white or yellowish white) without conspicuous spotting, and in the pronounced lobing of the calyx which is glabrous. The lobing of the calyx is not so regular nor so prominent as in *T. fragrans*, Roxb., but it is much more pronounced than in the scarcely toothed ring which is found in the section ***Meyenia***.

6847 **Tovaria finitima,** W. W. Sm. Sp. nov.

Species ex affinitate *T. Delavayi*, Franch. et *T. tatsienensis*, Franch. ; floribus roseis, stylo brevissimo ovarium haud aequante inter alia bene notata.

Planta 45–60 cm. alta, rhizomate crasso, fibris numerosis tomentellis. Caulis erectus sat crassus, stramineus in sicco, glaber. Folia 3–4 vel ad 7, plerumque in dimidio superiore, petiolo 10–20 mm. longo praedita ; lamina plerumque 10–18 cm. longa, 4–6 cm. lata, ovato-lanceolata vel oblongo-lanceolata, apice longissime et acutissime acuminata, acumine ipso minute scabrido-marginato, basi rotundata, utrinque glabra, in sicco membranacea. Inflorescentiae eleganter paniculatae floribus

longiuscule pedicellatis sed vix numerosis ; bracteae 1–2 mm. longae lineares vel lineari-lanceolatae ; axes glabri patenter ramosi ; pedicelli plus minusve 5 mm. longi floribus longiores. Perianthium circ. 8 mm. diametro saturate roseum, fere ad basim partitum, segmentis fere 4 mm. longis late ellipticis utrinque rotundatis vel obtusis. Stamina vix 1 mm. superantia filamentis complanatis deltoideis. Ovarium subglobosum circ. 2.5 mm. diametro, stylo vix 1 mm. longo apice obscure trilobulo, loculis tribus vulgo 2-spermis.

" Western China :—In the Shweli Valley, Yunnan, in shady situations. Lat. 25° 30′ N. Alt. 7000 ft. Plant of 1½–2 ft. Flowers deep dull rose. July 1913." G. Forrest. No. 12,040.

" Mingkwong Valley, Yunnan, in thickets. Lat. 25° 20′ N. Alt. 6500 ft. Plant of 2½ ft. In fruit. July 1912." G. Forrest. No. 8642.

" Upper Burma :—At Htawgaw, valley of Naung-Chaung, Lashi country, in forest, deep shade. 8000–9000 ft. Flowers greenish with red border. May 1914." F. Kingdon Ward. No. 1611.

The following in fruit and with the leaves sparingly pubescent on both sides is I believe the same :—

" Western flank of the Shweli-Salween divide, Yunnan, in shady situations in thickets. Lat. 25° 20′ N. Alt. 9000 ft. Plant of 2 ft. In fruit. Aug. 1912." G. Forrest. No. 9019.

With similar leaves is also :—

" Shweli-Salween divide, in open thickets and cane brakes. Lat. 25° 30′ N. Alt. 10,000 ft. Plant of 18–24 inches. Flowers dull deep rose. Sept. 1917." G. Forrest. No. 15,988.

Tovaria Wardii, W. W. Sm. Sp. nov.

Species valde affinis *T. atropurpureae*, Franch. a qua foliis subtus puberulis, racemis basi compositis, floribus albis vel roseo-tinctis, perianthii lobis obtusis, stylo ovarium aequante ex descriptione differt.

Planta 30–45 cm. alta rhizomate crasso. Caulis erectus, in sicco stramineus, infra glabrescens, in dimidio superiore subsparsim pubescens. Folia 6–8, petiolo brevissimo amplexicauli praedita ; lamina 12–16 cm. longa, 5–7 cm. lata, ovato-lanceolata, apice mediocriter acuminata, basi rotundata, supra glabra, infra sparsim pubescens, in sicco membranacea. Inflorescentiae racemosae basi bene ramosae multiflorae ; bracteae 1–1.5 mm. longae lineares vel lineari-lanceolatae ; axes ascendentes vix patentes densiuscule pubescentes ; pedicelli circ. 3 mm. longi pubescentes. Perianthium circ. 7 mm. longum album vel nunc roseo-tinctum, ad medium partitum, segmentis ovatis obtusis. Stamina vix 1 mm. longa, ad fauces tubi inserta, filamentis

subcylindricis antheras vix aequantibus. Ovarium ovoideum circ. 1.5 mm. longum glabrum stylum apice trilobulum subaequans. Fructus deest.

"Western China:—At A-tun-tsu, N.W. Yunnan, in rain-forest undergrowth. Alt. 10,000–12,000 ft. June 1913." F. Kingdon Ward. No. 556.

"Upper Burma:—Ridge of Naung Chaung, Nwai divide. Alt. 11,000–12,000 ft. Flowers pure white, or petals sometimes bordered with red. In damp shady moss-covered places on the ridge beneath dwarf bamboo brake. July 1914." F. Kingdon Ward. Nos. 1811, 1812.

4122 **Vaccinium oreogenes,** W. W. Sm. Sp. nov.

Species inter congeneres indo-burmanicos floribus solitariis ex axillis foliorum superiorum natis bene notata; folia eis *V. Doniani,* Wight sociorumque ejus subsimilia; nullo modo affinis *V. modesto,* W. W. Sm. speciei chinensi floribus solitariis praeditae.

Frutex ad 1 m. altus ramosus ramulis junioribus glabris valde angulatis bene foliatis, senioribus cinerascentibus. Folia petiolo 2–3 mm. longo latiusculo sparsim puberulo praedita; lamina plerumque 4–6 cm. longa, 1.5–2 cm. lata, lanceolata, apice sensim acuminata, basi cuneata, margine crebro et minute serrulata, supra opaco-viridis glabra, costa media pilosula excepta, infra paulo pallidior glabra papillosa, nervis 6–7 paribus subtus in sicco paulo prominulis. Flores in axillis superioribus solitarii pedicellis 6–7 mm. longis subarcuatis glabris suffulti; bracteolae cito deciduae 4–5 mm. longae lineari-lanceolatae membranaceae glabrae nunc ad medium pedicellum, nunc sub calycem positae. Calycis lobi deltoidei 2 mm. longi, apice apiculati, in sicco rubidi. Corolla globosa 8–9 mm. longa, lobis ovatis obtusis 1.5–2 mm. longis, ex collectore alba. Stamina 10 filamentis 3 mm. longis pilosis, antheris 1.5 mm. longis tubulis 2.5 mm. longis praeditis, aristis duabus subulatis dorso affixis. Ovarium circ. 3 mm. longum glabrum stylo 7 mm. longo. Fructus deest.

"Upper Burma:—Naung Chaung Valley on open grassy granite hills at 9000–10,000 ft. Small bushy shrub of 2–3 ft. Flowers white. July 1914." F. Kingdon Ward. No. 1732.

907 **Viburnum shweliense,** W. W. Sm. Sp. nov.

Species sectionis Thyrsosmatis, Rehder et affinis *V. yunnanensi,* Rehder a quo foliis multo majoribus, petiolis duplo majoribus glabrescentibus inter alia ex descriptione differt; facies ramorum atque foliorum *V. Simonsii,* Hook. f. et Thoms. in memoriam revocat.

Frutex 2–3 m. altus ; ramuli crassi glabri lenticellis magnis circularibus conspicuo conspersi cinerei. Folia petiolo 2–2.5 cm. longo subglabro vel pilis fasciculatis consperso supra sulcato suffulta ; lamina plerumque 8–12.5 cm. longa, 4–6 cm. lata, ovalis vel oblongo-ovalis, apice obtusa vel paulo acutata, basi plus minusve late cuneata, margine serraturis induratis numerosis notata, membranacea, decidua, supra atroviridis glabra, infra pallidior, ad costam paulo eminentem atque ad nervos pilis fasciculatis conspersa ; nervi 6–7-jugi paulo flexuosi in dentes excurrentes. Inflorescentiae terminales et ramulos breves laterales bifoliatos terminantes paniculatae, circ. 5 cm. longae, circ. 5 cm. latae, pilis fasciculatis albidis dense indutae ; pedunculus 3–4 cm. longus pilosus ; bracteae 2–5 mm. longae, linearilanceolatae vel sublineares, membranaceae, sparsim pilosulae. Calycis lobi ovati vix 1 mm. longi obtusi glabri. Corolla alba rotata ; tubus circ. 3 mm. longus glaber ; lobi 1.5–2 mm. longi late ovati reflexi. Stamina summam corollam aequantia ultra lobos reflexos projicientia. Ovarium turbinatum glabrum circ. 3 mm. longum.

" West China :—Shweli-Salween divide, Yunnan, in open scrub. Lat. 25° 20′ N. Alt. 10,000 ft. Shrub of 6–9 ft. Flowers creamy-white. July 1917." G. Forrest. No. 15,818.

1421 **Viola pogonantha,** W. W. Sm. Sp. nov.

Species ex affinitate *V. belophyllae*, de Boissieu (*V. serpens*, Wall., var. *macrantha*, Franch.) ; foliis longiuscule petiolatis longe acuminatis, petalis intus villosulis, ovario dense villosulo inter alia signa notata.

Planta 10–15 cm. alta. Rhizoma elongatum articulatum, ad collum stipulis emarcidis indutum, ut videtur estoloniferum. Caulis brevis foliis caulinis et basilaribus subsimilibus. Folia petiolo gracili 8–12 cm. longo infra glabro supra prope laminam setulis deflexis albidis bene praedito suffulta ; lamina 6–8 cm. longa, 3–4 cm. lata, plus minusve ovata, apice longiuscule acuminata, basi alte cordata lobis subrotundatis, margine regulariter serrato-crenata crenis obtusis, supra setulis albidis conspersa, infra ad costam nervosque satis setosula ; stipulae pallido-virides circ. 1.5 cm. longae lineari-lanceolatae longissime acuminatae subintegrae vel fimbriis glanduloso-capitatis paucis instructae. Pedunculi circ. 6–8 cm. longi petiolis breviores bracteolis linearibus circ. 7 mm. longis. Flores mediocres albi purpureo-striati. Sepala circ. 7 mm. longa, lineari-oblonga, apice obtusiuscula vel subacuta, albido-pilosula appendicibus circ. 2 mm. longis quadratis. Petala circ. 1 cm. longa, oblonga, intus ad dimidium inferius pilis albidis bene barbata ; calcar circ. 3 mm. longum, pro longitudine latum,

obtusissimum. Appendices connectivorum magni ovati antheris fere aequilongi. Stigma terminale truncatulum; ovarium minute villosulum. Capsula submatura fere globosa villosula seminibus paucis.

"West China:—Taping-pu Valley, Yunnan, in shady thickets by streams. Lat. 25° 30′ N. Alt. 7000 ft. Plant of 4–6 inches. Flowers white, veined purple. May 1913." G. Forrest. No. 9925.

597 **Wikstroemia leptophylla,** W. W. Sm. Sp. nov.

Inter species chinenses foliis linearibus glabris, inflorescentiis paniculatis, floribus pentameris bene notata.

Frutex 1–1.5 m. altus, ramosus, bene foliatus, ramulis novellis plus minusve quadratis gracilibus pallido-viridibus glabris, senioribus cinerascentibus. Folia opposita vix petiolata; lamina 3–6 cm. longa, 3–6 mm. lata, linearis vel lineari-lanceolata, apice plus minusve acuta, basi in insertionem sensim angustata, margine revoluta, in sicco membranacea, glabra, pallido-viridis, subtus pallidior, costa media infra eminente. Inflorescentiae ramulos terminantes, vulgo e racemis ternis compositae, circ. 6 cm. longae, 10–20-florae, glabrae, pedunculis 2–3 cm. longis, pedicellis vix 1 mm. longis. Perianthii flavido-viridis tubus 12–13 mm. longus, circ. 2 mm. latus, anguste cylindricus, glaber; lobi circ. 1.5 mm. longi, ovato-oblongi, obtusi. Stamina 8, biseriata, antheris 1 mm. longis filamenta superantibus. Ovarium circ. 4.5 mm. longum, oblongum, glabrum apice sparsim pilosulo excepto; stigma magnum capitatum stylo brevi suffultum. Fructus deest.

"West China:—Mountains in the N.E. of the Yangtze bend, Yunnan, in open dry situations amongst rocks. Lat. 27° 45′ N. Alt. 9000 ft. Shrub of 3–4 ft. Flowers yellowish-green. Sept. 1913." G. Forrest. No. 11,230.

"Mountains in the N.E. of the Yangtze bend, Yunnan, in open situations on the margins of thickets. Lat. 27° 45′ N. Alt. 10,000 ft. Shrub of 3–5 ft. Flowers green. July 1913." G. Forrest. No. 10,563.

Allied perhaps to *W. dolichantha,* Diels.

598 **Wikstroemia mekongensis,** W. W. Sm. Sp. nov.

Inter species chinenses tetrameras foliis papyraceis oblanceolatis vel obovatis obtusis glabris, inflorescentiis late paniculatis, floribus purpureo-kermesinis inter alia signa bene notata.

Frutex 1–2 m. altus, ramosus, bene foliatus, ramulis novellis subteretibus sat crassis pallido-viridibus glabris. Folia opposita petiolo crasso 1–2 mm. longo suffulta; lamina vulgo 4–5.5 cm. longa, 1.5–2.5 cm. lata, oblanceolata vel obovata, apice rotundata

breviter et obtusiuscule apiculata, basi late cuneata, margine plana, in sicco papyracea, glabra, supra pallido-viridis, infra pallidior, costa media infra conspicua albida, nervis lateralibus subobscuris. Inflorescentiae terminales late paniculatae, ad 12 cm. longae, ad 9 cm. latae, pedunculis crassis glabris, racemis ipsis circ. 20-floris sparsim albido-pilosulis, pedicellis circ. 1 mm. longis albido-pilosulis. Perianthii purpureo-kermesini tubus circ. 8 mm. longus, 1 mm. latus, anguste cylindricus, sparsim pilosulus; lobi 1 mm. paulo superantes oblongi obtusi; disci squama unica oblonga apice erosa. Stamina biseriata antheris circ. 1 mm. longis filamenta superantibus. Ovarium circ. 2.5 mm. longum apice pubescens, stigmate capitato, stylo brevissimo. Fructus deest.

" West China :—Mekong Valley, Yunnan, in open situations amongst rocks by streams. Lat. 27° 40′ N. Alt. 8000 ft. Shrub of 3–6 ft. Flowers deep purple-crimson. July 1914." G. Forrest. No. 13,079.

In appearance this species suggests *W. scytophylla*, Diels, but differs very widely in the inflorescence. In cultivation the flower buds are purplish at the apex but the flowers are greenish-yellow.

Notes on certain Asiatic Styracaceae.

BY

WILLIAM WRIGHT SMITH, M.A.

THE species described in the following paper are :—

Parastyrax Lacei, W. W. Sm., p. 232.
Pterostyrax burmanicus, W. W. Sm. et Farrer, p. 233.
Styrax biaristatus, W. W. Sm., p. 233.
Styrax Buchananii, W. W. Sm., p. 234.
Styrax shweliensis, W. W. Sm., p. 236.

The recent acquisition by the Royal Botanic Garden of important collections of Asiatic plants such as the herbaria of Léveillé and of Lace and the material resulting from the further explorations of Forrest, Farrer, and Ward in Yunnan and Upper Burma have elucidated various problems which from the paucity of specimens previously available presented many difficulties to the student of the flora of these regions. Among other orders this is true of the *Styracaceae*, and in addition to the description of three new species the present short paper gives a fuller account of two Burmese plants previously imperfectly known.

Of the three new species described, one, *Pterostyrax burmanicus*, W. W. Sm. et Farrer, is an interesting extension westwards of the genus, and incidentally an example of the important results which will attend an adequate exploration of the alpine regions of Burma. The two previously known Burmese plants for which I have had to form new names are also of interest. *Styrax Buchananii* is I believe equivalent to a plant collected long ago by Griffith, which has remained inadequately described under a varietal name until the collections of Buchanan and Lace came to aid the solution. The other described by the writer in 1911 as *Styrax Lacei* is in the light of the further material secured by Lace not to be retained in that genus, but forms the basis of a new genus *Parastyrax*. The fruit is now available and separates the plant from both *Styrax* and *Pterostyrax*.

Parastyrax, W. W. Sm. Genus novum *Styracacearum*.

Genus a *Styrace*, Linn., ovario infero recedens ; *Pterostyraci*, Sieb. et Zucc. valde affinis sed calycis tubo infra ovario adnato

supra in annulum laxum connato, fructu magno ellipsoideo nec alato nec costato, exocarpio carnosulo distinguitur.

Arbor altissima. Folia alterna subcoriacea minute calloso-denticulata. Flores in ramulis hornotinis ex axillis foliorum superiorum orti, in racemos congestos simplices vel parum ramosos dispositi. Calyx infra ovario adnatus supra in annulum cupularem connatus, subinteger. Corollae petala 5, decidua, ima basi paululo cohaerentia, in aestivatione imbricata, erectiuscula. Stamina 10, inclusa, a petalis libera, subaequalia, filamentis in tubum cylindricum connatis; antherae oblongae introrsae. Ovarium pro maxima parte inferum 3-loculare, multiovulatum; stylus elongatus subulatus apice capitatus. Drupa oblongo-ellipsoidea, exocarpio carnosulo praedita, indehiscens, teres vel subteres, abortu 1–2-locularis, 1–2-sperma, maturitate glabra lenticellis magnis notata. Species unica burmanica.

178 **Parastyrax Lacei,** W. W. Sm. Comb. nov. *Styrax Lacei,* W. W. Sm. in Kew Bull., 1911, p. 344.

Additional material of this tree is now available which entails certain corrections and additions to the original description. Instead of a tree of moderate height, it is one of 150 feet or over. The inflorescences are axillary to the upper leaves; I have not found one truly terminal. The flowers are noted as yellow. The calyx adnate below to the inferior ovary is prolonged upwards into a narrow ring with a slightly irregular margin but not toothed. The staminal filaments are united into a tube glabrous outside, minutely pilose inside; free part of the filaments very short or almost absent. The mature fruit is wholly inferior, ellipsoid, 3 cm. long by 1 cm. broad, covered with a thin fleshy exocarp, and marked by elongate whitish lenticels; the endocarp is very hard and woody; there are no indications of either wings or ridges on the mature fruit which is said to be edible.

I can now give Lace's full note on No. 5107 :—

"Upper Burma :—Kadu Hill, Katha District, alt. 3000–4000 ft. 23rd Feb. 1910. 'Nanem,' Kachin. Large tree, 150 ft. and over in height. Long clean bole and crown composed of pale rather few but strong branches. Calyx truncate. Petals 5 yellow, pubescent on both sides, imbricate in bud; later overlapping and slightly coherent at base. Stamens 10, joined in tube which is rather inflated at base. Stigma terminal. Ovary appears half inferior. Measured one specimen 13 ft. in girth and about 160–170 ft. high. Bark $\frac{3}{4}$ in. thick, reddish inside; no heartwood; wood white. The fruit is said to be large, $1\frac{1}{2}$ in., and is eaten. Common tree in evergreen forest on the Kadu

Hill between 3000 and 4000 ft." Lace No. 5107 in Herb. Kew. Calcutt. et Edin.

" Kadu Hill, 4000 ft., 10th July 1911. Fruiting specimen. Tree 10 ft. in girth at 7 ft. from ground; total height 117 ft. To first branch 67 ft., of which mid-girth was 7 ft. 4 inches. Buttressed at base." Lace No. 5340 in Herb. Edin.

Pterostyrax burmanicus, W. W. Sm. et Farrer. Sp. nov.

Species affinis *P. hispido,* Sieb. et Zucc. a quo foliis anguste lanceolatis, floribus praecocibus multo majoribus differt.

Arbor altissima ex collectore. Ramuli hornotini vix evoluti; seniores cinerascentes glabri decorticantes. Folia sub anthesin haud bene evoluta; lamina 5–5.5 cm. longa, 1–1.5 cm. lata, anguste lanceolata, apice acutata, acumine ipso obtusiusculo, basi cuneata, margine minute denticulata, juventute membranacea, pilis stellatis sparsim munita; petiolus fere 1 cm. longus parce stellato-pilosus. Flores praecoces ex axillis foliorum delapsorum orti, in paniculas multifloras (vulgo 15–25-floras) ad 8 cm. longas dispositi vix 2 cm. longi; rhachis dense canescenti-stellato-pilosa; bracteae .7–10 mm. longae lineares cum pedicellis 5–8 mm. longis stellato-pilosae. Calycis tubus circ. 3–4 mm. longus, ovario adnatus, nervis quinque dentibus oppositis prominulis pererratus, canescenti-pilosus; dentes 5 circ. 1.5 mm. longi, triangulares acutissimi. Petala circ. 1.8 cm. longa, circ. 1 cm. lata, libera, in aestivatione imbricata, obovata, apice rotundata, alba. Stamina 10, quinque paululo breviora, filamentis in dimidio inferiore in annulum connatis, pilis albis simplicibus bene indutis. Ovarium pro maxima parte inferum 3–4-loculare multiovulatum stylo fere ad apicem stellato-piloso corollam aequante vel paulo superante. Fructus deest.

" East Upper Burma :—Langyang, at 7000 ft.; extremely floriferous and fragrant, dotting the jungle with its white masses, but such a tall and bare-stemmed tree that only gunshot could procure specimens. April 2nd, 1919." R. Farrer. No. 803.

287 **Styrax biaristatus,** W. W. Sm. Sp. nov.

Species ex affinitate *S. odoratissimi,* Champ. et *S. Veitchiorum,* Hemsl. a quibus floribus minoribus, calyce fere ad medium in lobos triangulares fisso, staminibus apice biapiculatis filamentis tomentosis, stylo ad apicem pilosulo, fructu resupinato differt.

Frutex 6–9 m. altus. Ramuli subteretes cito glabrescentes, vetustiores cinerei. Folia petiolo 1–1.5 cm. longo sparsissime stellato-piloso praedita; lamina vulgo 9–11 cm. longa, 3–4 cm. lata, oblonga vel elliptico-oblonga, apice acuminata, basi late et saepe asymmetrice cuneata, margine remote et minute denti-

culata, in sicco tenuiter papyracea, supra opaco-viridis glabra, infra vix pallidior, glabra nisi ad axillas nervorum sparsim tomentellas, nervis utrinsecus 7–9-paribus infra paulo eminentibus. Inflorescentiae paniculatae, terminales atque axillares, 6–10 cm. longae, multiflorae; axes dense incano-stellato-tomentosi; bracteae lineares mox caducae. Calyx cupuliformis circ. 2 mm. longus, fere ad medium in lobos triangulares subacutos fissus dense adpresso-incano-tomentosus. Corolla flavida 5-partita, tubo fere nullo, lobis in aestivatione imbricatis, 8–9 mm. longis, 2.5 mm. latis, anguste oblongis, subobtusis, utrinque flavescenti-stellato-tomentellis. Stamina 10, filamentis fere liberis 3 mm. longis dense stellato-pilosis, antheris circ. 2 mm. longis, connectivo pilosulo apice producto biaristato. Ovarium ovoideum superum 3-loculare multiovulatum tomentosum; stylus 7–8 mm. longus cylindricus crassus undique pilosulus. Fructus circ. 4 mm. longus ovoideus resupinatus calyce paulo aucto fere omnino inclusus.

"Western China:—In thickets in ravines on the western flank of the Shweli-Salween divide, Yunnan. Lat. 25° 40′ N. Alt. 9000 ft. Shrub of 20–30 ft. Flowers fragrant, creamy-yellow. May 1919." G. Forrest. No. 18,020.

"N'Maikha-Salween divide, at Ho-tou, Yunnan, in thickets and open forests. Lat. 25° 55′ N. Alt. 7000–8000 ft. Shrub of 12–18 ft. In fruit. Aug. 1919." G. Forrest. No. 18,400. (Also No. 18,833, Nov. 1919.)

The following Henryan sheets in fruit are referable in my opinion to the same species:—

"Mengtze, S.E. mountain forests. 6000 ft. Tree of 15 ft." A. Henry. No. 10,764.

"South of Red River, Yunnan. Tree of 40 ft." A. Henry. No. 13,662.

"Mengtze, Yunnan. Shrub of 10 ft." A. Henry. No. 13,662A.

Styrax Buchananii, W. W. Sm. Sp. nov.

? *S. serrulatus*, Roxb., var. *latifolius*, Perk. in Engl. Pflanz., Styracaceae (1907), 37.

Species affinis *S. serrulato*, Roxb. a quo foliis multo latioribus, calyce densissime piloso, antheris parte libera filamentorum duplo longioribus inter alia discriminatur.

Arbor parva; rami subteretes, juniores densissime incano- vel fulvo-stellato-tomentosi, seniores glabrescentes. Folia petiolo 3–4 mm. longo tomentoso munita; lamina 6–16 cm. longa, 4–11 cm. lata, vulgo late oblonga, apice ambitu subrotundata nunc breviter acuminata nunc obtusissima, basi rotundata, margine minute et irregulariter denticulata, papyracea, supra

ad costam nervosque densiuscule fulvo-stellato-pilosa ceterum sparsissime, infra paulo densius quam supra induta, nervis 5–6-jugis utrinque in sicco conspicuis. Inflorescentiae axillares et terminales, racemosae, 3–10 cm. longae, 3–20-florae; rhachis dense et molliter incano-tomentosa; bracteae circ. 3 mm. longae, lineares; pedicelli circ. 5 mm. longi incano-tomentosi; flores albi circ. 1.5 cm. longi. Calyx late cupuliformis, circ. 5 mm. longus, ore 5 mm. latus, densissime fulvo-tomentosus, margine truncatus dentibus 5 minutis. Corolla 5-partita, tubo 3 mm. longo, lobis in aestivatione valvatis circ. 13 mm. longis ad 4 mm. latis lanceolatis vel ovato-lanceolatis acutiusculis extra minute tomentosis. Stamina 10, filamentis parte libera 3 mm. longis undique longiuscule stellato-pilosis, antheris 6 mm. longis pilis stellatis conspersis. Ovarium longe albo-pilosum stylo ad duas partes inferiores piloso supra glabro. Fructus deest.

"Upper Burma:—Myitkyina in Mara Nantan forest, Kaukkwe Valley. Alt. 2000 ft. March 1912. Small tree. Flowers sweet-scented." E. M. Buchanan. No. 51. Type.

"Myitkyina at Lamaing. Alt. 2500 ft. March 1909." E. M. Buchanan. No. 21.

"Bhamo District, road to Sinlumkaba. Alt. 4000 ft. 5th April 1919. Small tree." Lace. No. 5737.

This species is in all probability identical with Griffith's No. 3670 in Herb. Kew., collected in the Ruby Mines District of Burma. To this imperfect specimen Miss Perkins gave the varietal name of *latifolius* and attached it to *S. serrulatus*, Roxb. with the note:—"Verisimiliter species nova; materia vero nimis incompleta de hac re disceptare non possumus." There is a *S. latifolius*, Pohl from Brazil.

Styrax grandiflorus, Griff.

S. touchanensis, Lévl.

"Tou-chan, Yunnan. April 1902." E. Bodinier.

"Flanks of the Mingkwong Valley, Yunnan, in thickets. Lat. 25° 15′ N. Alt. 7000 feet. Tree of 30–40 ft. In fruit. June 1912." G. Forrest. No. 8042.

"Shweli Valley, Yunnan, in open situations. Lat. 25° 30′ N. Alt. 6000 ft. Shrub of 10 ft. Flowers creamy-white, fragrant. Anther orange. May 1913." G. Forrest. No. 11,945.

"Shweli-Salween divide, Yunnan, in open situations on the margins of mixed thickets. Lat. 25° N. Alt. 7000 ft. Shrub of 20 ft. Flowers creamy-white. June 1919." G. Forrest. No. 17,899.

The same in fruit. Sept. 1919. No. 18,455.

Not previously recorded from China.

214 **Styrax shweliensis,** W. W. Sm. Sp. nov.

Species affinis *S. hypoglauco,* Perk. a quo foliis minoribus breviter acuminatis crebre et minute denticulatis supra pilosulis infra cinereo-tomentosis, inflorescentiis paucifloris, calycis tubo multo majore ferrugineo-tomentoso dentibus minutis irregularibus differt ; haud procul a *S. Perkinsiae,* Rehder a quo foliis crebre serratulis, pedicellis calycibusque ferrugineis primo intuitu distinguitur ; a *S. langkongensi,* W. W. Sm. foliis ovalibus vel ellipticis infra tenuiter cinereo-tomentosis inter alia recedit.

Frutex 2–3 m. altus; rami subteretes, hornotini dense cinereo- vel subferrugineo-tomentosi, annotini glabrescentes et decorticantes. Folia petiolo 4–5 mm. longo dense stellato-tomentosa praedita ; lamina vulgo 5–6 cm. longa, 3–3.5 cm. lata, ovalis vel late elliptica, apice breviter acuminata, basi rotundata vel subrotundata, margine crebre et minute denticulata, papyracea, supra pilis furcatis praesertim ad costam bene conspersa, infra indumento tenui stellato cinereo induta nervis lateralibus 4–5. Inflorescentiae pauciflorae, 1–3-florae, axillares et terminales ; flores circ. 2 cm. longi, albi, pedicello 7–9 mm. longo dense ferrugineo-tomentoso muniti. Calyx cupuliformis circ. 5 mm. longus, nunc ore truncatus dentibus minutis, nunc irregulariter dentatus, dense ferrugineo-stellato-tomentosus. Corolla 5-partita, tubo 3 mm. longo, lobis in aestivatione imbricatis, 13 mm. longis, 5–6 mm. latis ovato-lanceolatis vel subobovatis, obtusiusculis, extra molliter flavescenti-stellato-tomentosis. Stamina 10, filamentis parte libera complanatis circ. 6 mm. longis albopilosis ; antherae circ. 4 mm. longae pilis stellatis parce munitae. Ovarium dense albido-tomentosum stylo circ. 13 mm. longo fere ad apicem pilosulo. Fructus ovoideus, 12–18 mm. longus, ad 1 cm. latus, breviter mucronatus, calyce persistente inclusus, tomentosus.

"West China :—Tengyueh-Shweli divide, Yunnan, in open situations amongst scrub. Lat. 25° N. Alt. 7000 ft. Shrub of 6–9 ft. Flowers dull creamy-white. May 1913." G. Forrest. No. 9869.

"Mekong-Salween divide, Yunnan, in open thickets. Lat. 25° 10′ N. Alt. 8000–9000 ft. Shrub of 10–12 ft. In fruit, July 1919." G. Forrest. No. 18,249.

Species of Styrax in Herb. Léveillé.

BY

WILLIAM WRIGHT SMITH, M.A.

THE following notes are in the nature of a supplement to the preceding paper on the Asiatic Styracaceae. They give the results of a survey of the species of Styrax described or recorded from China by the late Monseigneur Léveillé. The meagreness of the material on which Léveillé founded many of his species and the correspondingly inadequate descriptions render it difficult for any botanist to appraise the validity or sometimes even to recognise the affinity of the species concerned. The possession of the types makes a review of his species possible, but many of these must still be classed among the "imperfectly known." Of his species of Styrax there are one or two which I can neither relegate to a previously known species nor confirm the validity of. In his floras of Kweichow and of Yunnan Léveillé has recorded various species of Styrax. In so far as these are represented in his collection I have given an opinion as to the correctness or otherwise of the record. One species I have failed to trace—*Styrax Esquirolii*, Lévl. in Fedde, Repert., ix (1911), 446. It is not in his herbarium. In his Flore du Kouy-Tchéou this species is omitted from the key and from the list of his species of Styrax, perhaps by accident or possibly by design. The double omission suggests that the specimen may have been lost—it is No. 22 Esquirol, one of that collector's earliest specimens—or the validity of the species perhaps became a matter of doubt to the author. If Esquirol's number is not in any other herbarium the species is fated to remain a dubious quantity.

The following is the list of the named species of Styrax in Léveillé's herbarium. I have appended my comments on each species. I have failed to come to any definite decision regarding *S. Argyi*, Lévl. and *S. Cavaleriei*, Lévl.

1. **S. Argyi,** Lévl. in Fedde, Repert., xi (1912), 64. Type. Province of Kiangsu. Coll. d'Argy.

There are no details of locality or date. Material consists of twigs with fruits and of twigs with flowers in bud only.

Probably a form of *S. Faberi*, Perk., but the specimens are too incomplete to warrant a decision.

2. **S. Bodinieri,** Lévl. in Fedde, Repert., iv (1907), 332. Type. Province of Kweichow. "Environs de Kouy-Yang, mont du Collège ; grande arbuste à fleurs blanches odorantes ; fin avril 1898. No. 2221. Emile Bodinier."

This is *S. japonicus*, Sieb. et Zucc. The stamens are not glabrous.

3. **S. Cavaleriei,** Lévl. in Fedde, Repert., iv (1907), 331. Type. Province of Kweichow. "Long-ly, 7 mai 1903 ; fl. blanches. No. 997. Jul. Cavalerie."

This is closely allied to *S. grandiflorus*, Griff., differing in the more glabrous pedicels and more deeply cut calyx. It may be only a form of that species, but without more material than the one twig available I can only leave the point undecided.

4. **S. hypoglaucus,** Perk. Recorded for Province of Kweichow in Léveillé's Flore du Kouy-Tchéou, p. 407. "Environs de Kouy-Yang, mont du Collège ; arbuste ; fleurs blanches, odorantes ; fin avril 1898. Emile Bodinier. No. 2222."

This is not *S. hypoglaucus*, Perk. It belongs to the section *Valvatae*, closely allied to *S. dasyanthus*, Perk. and probably only a form of it.

5. **S. japonicus,** Sieb. et Zucc. Korea : "Quelpaert, Taquet, Nos. 1109, 3033, 3034 ; U. Faurie, Nos. 725, 726, 727, 729, 1876." Kweichow :—"Pinfa, bois, petit arbre ; août 1908. J. Cavalerie. No. 3319.

These are all referable to the species.

6. **S. Leveillei,** Fedde ex Lévl., Flore du Kouy-Tchéou (1915), 407.

S. Cavaleriei, Lévl. in Fedde, Repert., ix (1911), 447, nec *S. Cavaleriei*, Lévl. in Fedde, Repert., iv (1907), 331.

In describing this plant Léveillé overlooked the fact that he had given the name of *S. Cavaleriei* to an entirely different plant four years before. As it happens his type plant is *Pterostyrax hispidus*, Sieb. et Zucc. Therefore all that is necessary is to transfer Léveillé's original name for this plant and Fedde's emendation to the synonymy of *Pt. hispidus*.

7. **S. Obassia,** Sieb. et Zucc. "Korea :—Quelpaert. Taquet, Nos. 1108, 3035, 3036 ; U. Faurie, Nos. 728, 1875."

This is the species.

8. **S. odoratissimus,** Champ. "Hong-kong. Bel arbuste, souvent d'assez grande taille, à belles fleurs blanches ; ça et là dans la mont. ; spécial à l'île. 3 avril 1899. Emile Bodinier. No. 1099."

This is the species.

9. **S. prunifolius,** Perk. Yunnan :—"Nord ; petit arbre—feuilles caduques, fl. blanches pendantes ; forêts de montagnes à Ku-long-tchang ; alt. 800 m. E. E. Maire."
"Nord ; arbre moyen—feuilles caduques, fleurs decombantes —blanches ; forêts des collines à Long-ky ; alt. 750 m. E. E. Maire."
"Kweichow :—Gan chouen ; mai 1912. J. Cavalerie. No. 3319."
"Kien-lin-chang, mai 1904. J. Esquirol. No. 21."

Recorded by Léveillé for Yunnan and Kweichow.

All are referable to *S. japonicus*, Sieb. et Zucc. *S. prunifolius*, Perk. is a synonym of *S. odoratissimus*, Champ. according to Perkins, Styracaceae, p. 69.

10. **S. suberifolius,** Hook. et Arn. "Hong-kong ; grand arbuste commun dans les bois, la mont. ; spécial au sud de la Chine. Emile Bodinier. No. 1122."

This is the species.

11. **S. touchanensis,** Lévl. in Fedde, Repert., xi (1912), 64. Type. Province of Kweichow. "Tou-chan, avril 1902. E. Bodinier." "Diffère du *Bodinieri* par calice velu et par calice et pedicelles blanchâtres."

This is *S. grandiflorus*, Griff.

A New Erlangea.

BY

SPENCER LE M. MOORE, B.Sc., F.L.S.

Erlangea (§ *Bothriocline*) **venustula,** sp. nov. Herba erecta, *caule* subsimplici subtereti folioso sericeo-tomentoso ; *foliis* inferioribus oppositis superioribus alternis brevipetiolatis (summis subsessilibus) ellipticis vel elliptico-oblongis obtusis basi angustatis integris membranaceis supra pilis glandulosis perpaucis simplicibus intermixtis puberulis subtus albo-sericeo-tomentosis ; *capitulis* parvis campanulatis fere 50-flosculosis in cymam terminalem pluricephalam sparsim bracteatam sericeo-tomentosam ordinatis ; *pedunculis propriis* involucro plerumque longioribus ; *involucri* phyllis 3-serialibus lanceolato-oblongis obtusis interioribus saepe pallide roseo-marginatis extus pubescentibus ; *flosculis* exsertis ; *achaeniis* oblongo-obovoideis apice truncatis pauci-costatis puberulis ; *pappi* setis perpaucis ciliolatis.

British East Africa ; cultivated in the Royal Botanic Garden, Edinburgh, from seeds collected in 1916 north of Nairobi by Rev. Andrew Urquhart ; alt. about 6000 ft. ; fl. in cult. March–May 1920.

Folia 3–4.5 cm. long., 1.5–2.5 cm. lat., summa gradatim usque 1–2 cm. long. imminuta, supra in sicco laete virentia ; petioli plerique 3–5 mm. long. Cyma 5×5 cm. Bracteae lineares, 3–5 mm. long. Pedunculi proprii ± 7 mm. long. Involucra 5×5 mm. ; phylla extima 2 mm. ; intermedia 3–4 mm. ; intima 5 mm. long. Corollae puberulae, violaceo-purpureae ; tubus cylindricus, 3 mm. long. ; lobi lineari-oblongi, acuti, tubo circa aequilongi. Androecium superne exsertum. Styli rami ex involucro eminentes, 2 mm. long. Achaenia humectata 1 mm. long. Pappi setae verisimiliter 4 vel 5, circa 1.5 mm. long., maxime caducae.

Except for the opposite leaves on the lower part of the stem this looks much like *E. marginata*, S. Moore, which, however, has a less hairy involucre with the scales running out into a sharp point. The involucres are more like those of *E. cordifolia*, S. Moore, but the leaves of this are unlike. Both these species belong to § Platylepis.

In its quite entire leaves this differs from all other described species referred to § Bothriocline.

[Notes, R.B.G., Edin., No. LIX, May 1920.]

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The Occurrence of Tracheides in the Nucellus of Steriphoma cleomoides, Spreng.

BY

MATTHEW YOUNG ORR,

Assistant in Laboratory, Royal Botanic Garden, Edinburgh.

With Plate CLXVI.

THE occurrence of tracheidal elements in the sporogenous tissue of ovules has been recorded, up to the present time, in only three genera, belonging to families possessing no close phylogenetic relationship.

They were first described by Treub * as occurring in the nucellus of *Casuarina glauca*, Sieb., and *Casuarina Rumphiana*, Miq. As figured in his paper, they are elongated, narrow, pointed cells, and their production in the sporogenous tissue suggested to him an analogy with the formation of elaters in the Hepaticae. Their function he regarded as a matter for speculation.

Miss Benson,† in her investigations on the embryology of the Amentiferae, recorded the occurrence of small tracheides around the antipodal end of the embryo sac of *Castanea vulgaris*, Lam. She suggested that these elements were vestigial in character and that they represented some former organ—" possibly a vascular strand connecting the chalaza with the sporogenous tissue."

The third instance is recorded by Frye ‡ in his work on the Asclepiadaceae. In his examination of the ovule of *Asclepias cornuta*, Dec., he noted the presence of a tracheid near the base of the embryo sac, and slightly projecting into it. This author favours Miss Benson's suggestion as to the origin of these tracheides, but is unable to reconcile their occurrence in a specialised family like the Asclepiadaceae with their supposed primitive character.

While examining sections of the ovaries of certain Capparidaceae, the author of this note observed the occurrence of elongated elements, with well-defined annular thickening on

* M. Treub in Ann. du Jard. Bot. de Buitenzorg, x (1891), p. 170.
† M. Benson in Trans. Linn. Soc., iii (1894), pp. 412, 421.
‡ T. C. Frye in Botanical Gazette, xxxiv (1902), p. 402.

Wt. 11147/158—375—2/21.—N. & Co., Ltd. Gp. 10.

their walls, in the nucellus of many of the ovules of *Steriphoma cleomoides*. They were particularly obvious in sections stained with gentian-violet.

They occur singly, and in groups of two or three together, abutting on the mature embryo sac, and extending from its organic base over the whole length of the sac in the direction of the micropyle.

Their form and structure suggest that they are tracheidal in nature, although the production of tracheides in sporogenous tissue is of such rare occurrence. They are completely isolated from the vascular strand traversing the funicle, and there is no evidence of any connection with the chalaza.

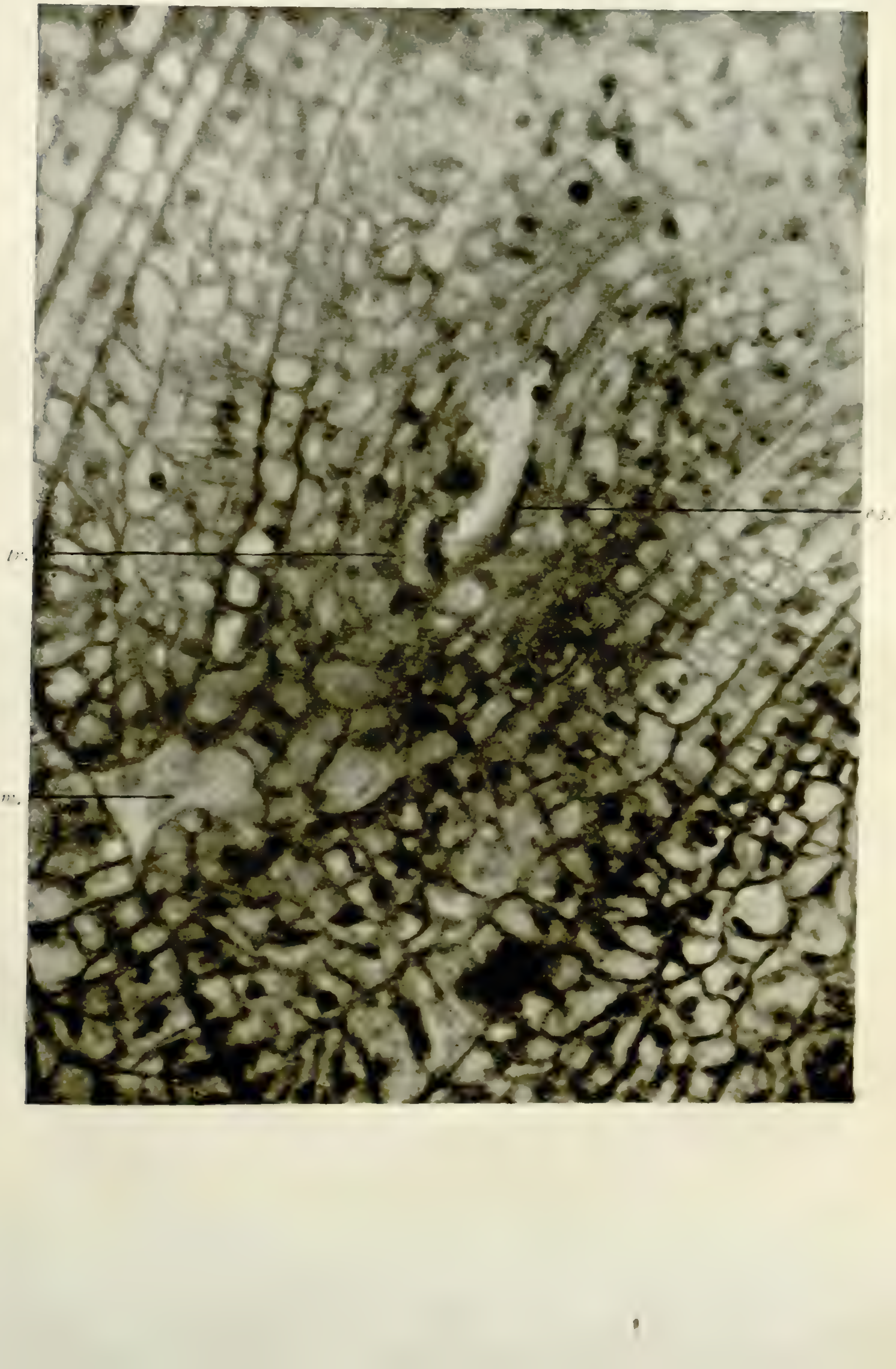
As more mature ovaries of *Steriphoma* were unobtainable at the time, the ultimate fate of these elements could not be traced, and an examination of the ovules of some of the allied genera failed to disclose the presence of similar structures.

No satisfactory explanation can be found to account for the production of these tracheides in the nucellus of *Steriphoma*, and, at present, it is not possible to say whether they play a definite part in the economy of the ovule, or are merely survivals of a primitive feature traceable to the vascular sporangia of a long-extinct ancestor. In either case, their non-occurrence in the nucellar tissue of the ovules of allied genera is peculiar, although their limitation to one genus of a family is in accordance with the findings of other authors.

EXPLANATION OF PLATE CLXVI.

Illustrating Mr. M. Y. Orr's paper on Steriphoma.

Ovule of *Steriphoma cleomoides* in longitudinal section. *m.*, micropyle; *e.s.*, embryo sac; *tr.*, tracheid.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IV.
III.

The Structure of the Ovular Integuments and the Development of the Testa in Cleome and Isomeris.

BY

MATTHEW YOUNG ORR,

Assistant in Laboratory, Royal Botanic Garden, Edinburgh.

With Plate CLXVII and four figures in the text.

In the course of an investigation on the anatomy of the ovules and seeds of the Capparidaceae, certain interesting features * were disclosed in the Cleomoideae section of the family, which may or may not be characteristic of the family as a whole, but which certainly appear to be sufficiently distinctive to merit a separate detailed description.

The species upon which this research was carried out were *Cleome spinosa*, Jacq., and *Isomeris arborea*, Nutt., and the material was obtained from living plants grown in the Royal Botanic Garden. The ovaries and fruits were fixed in chrom-acetic acid, and the microtomed sections were variously stained, the best results being secured with a combination of gentian-violet and eosin.

The general features of the campylotropous ovules and seeds of these species are so well known that they will only be referred to in passing, the main purpose of this paper being to direct attention to two of the outstanding anatomical features, namely, the genesis of the fibrous testa, and the occurrence of stomata in the outer integument of the ovule. In these points *Cleome* and *Isomeris* have so much in common that the detailed description will be confined to the former, and merely a brief note of the points of difference will be made in the case of *Isomeris*. Apart from the anatomical peculiarities, it will be observed that the physiological aspect of the structures described is also suggestive.

* The features described in this paper were not noted by Brandza in his dissertation, "Développement des Téguments de la Graine" (Rev. gén. bot., iii, 1891, p. 73), or by Guignard in his researches on the "Tégument séminal" (Journ. de bot., vii, 1893, p. 57). Both these authors included the Capparidaceae in their works.

[Notes, R.B.G., Edin., No. LX, January 1921.]

Cleome spinosa, Jacq.

The ovules of *Cleome* possess two integuments which originate from the base of the ovule in the usual way. At maturity, the outer integument consists of two layers of cells, while the inner integument is composed of one outer layer of comparatively large thin-walled cells with sparse protoplasmic contents, and three layers of small cells on its inner side. The outer layer, with its large clear cells, has the appearance of aqueous tissue,

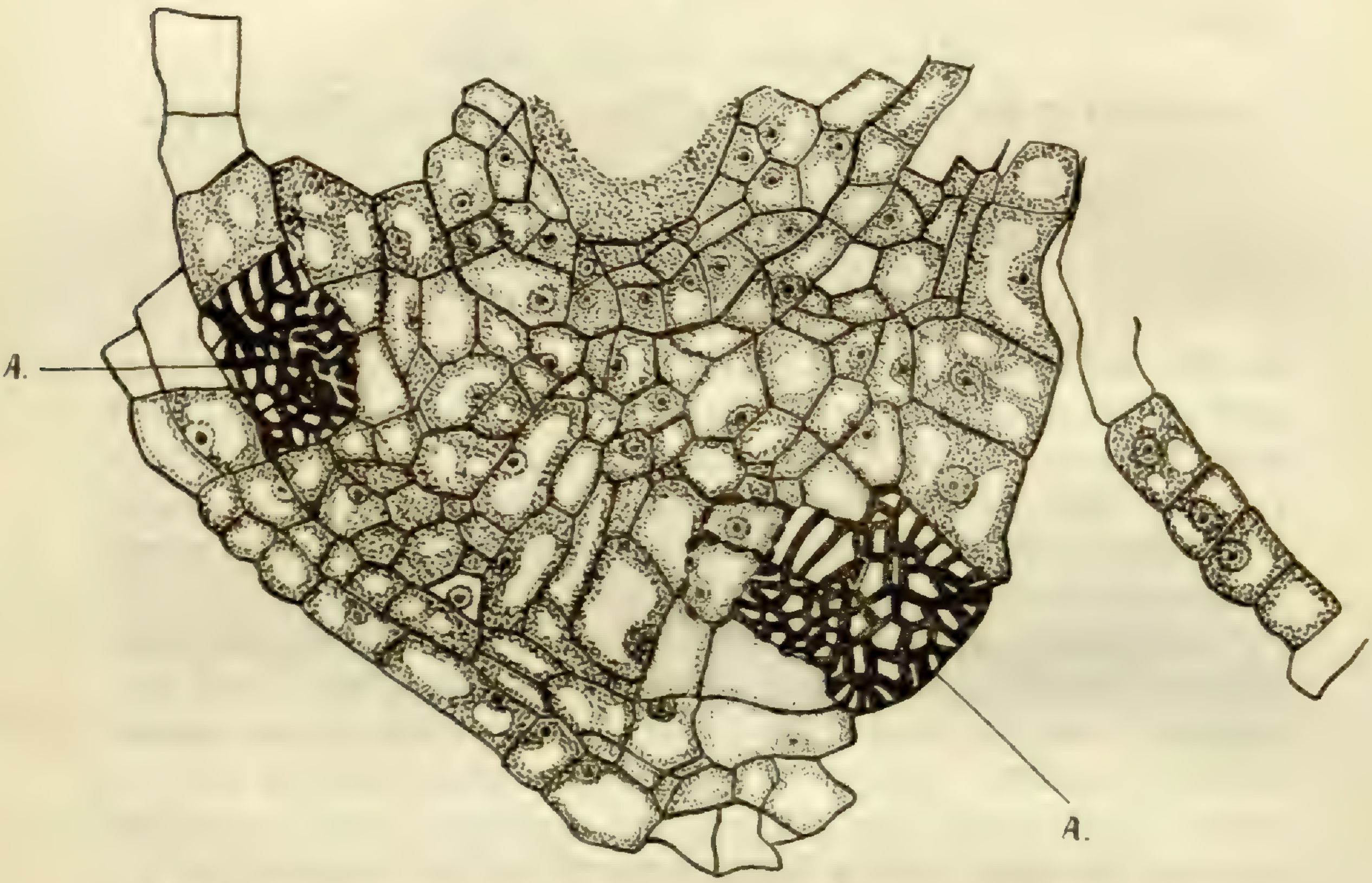

FIG. 1.—Micropylar region of the ovule of *Cleome spinosa*, showing at A the initiation of the lignified tissue. × 350.

and no doubt does function at this stage as a distributer of water.

An examination of longitudinal sections of the young ovule revealed, further, the presence of conspicuous patches of relatively large thick-walled elements, characterised by spiral and reticulate thickening of the cell walls. These lignified elements were confined entirely to the tissue of the inner integument in the region of the micropyle (fig. 1). In the older ovules, these thick-walled cells extend from the outer margin of the integument inwards to the micropyle, abutting directly on the slit, and giving to the ovule a somewhat unusual appearance (fig. 2). Sections cut transversely through this region, at this stage, show that these lignified cells are disposed in the form of a broad ring completely encircling the micropylar pore. These

cells retain their living contents even after lignification of the cell membrane is completed.

In the mature ovule this tissue extends upwards to a point just above the apex of the nucellus, where it merges, somewhat abruptly, into the enveloping layer of aqueous cells. For a

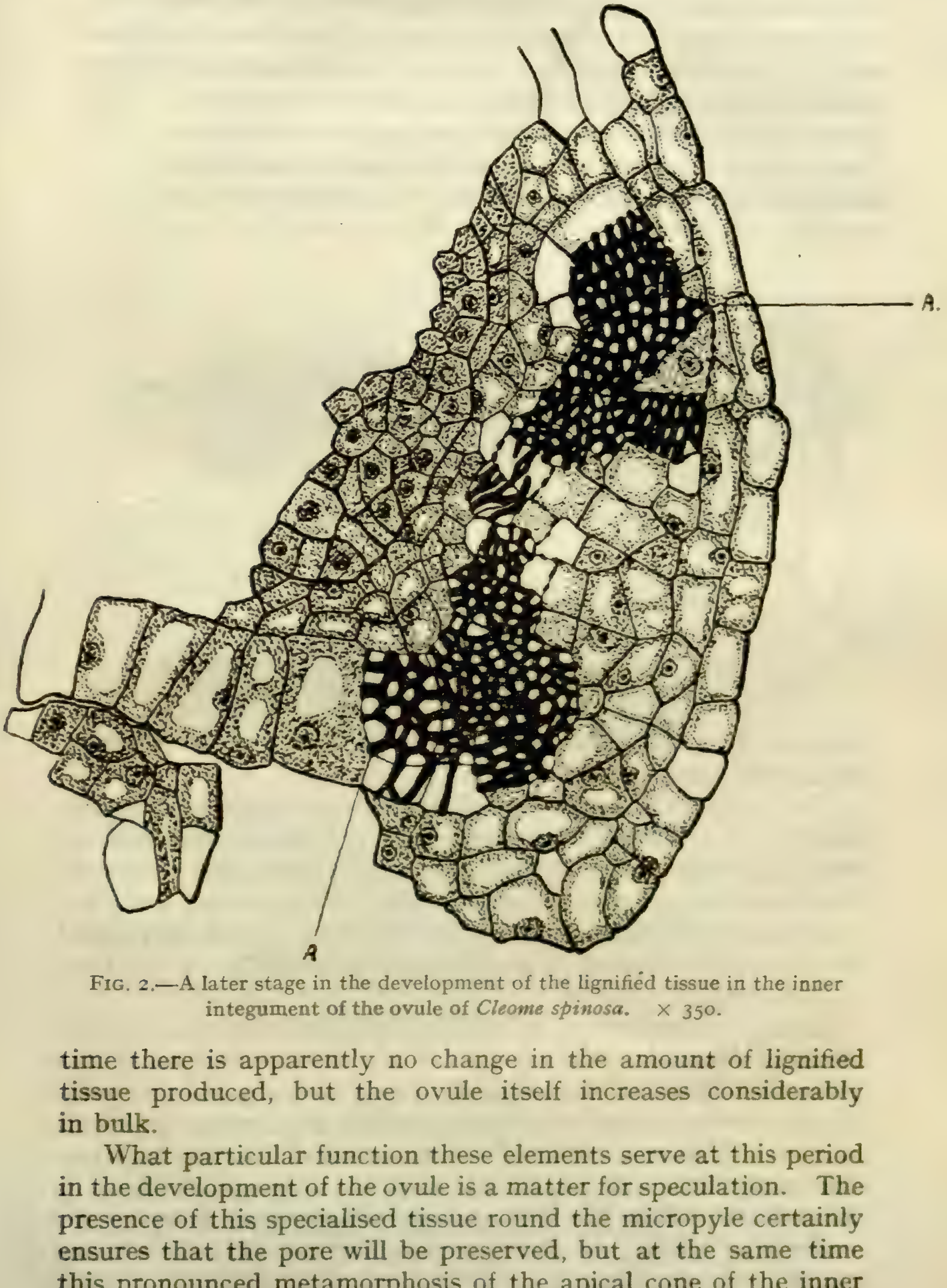

FIG. 2.—A later stage in the development of the lignified tissue in the inner integument of the ovule of *Cleome spinosa*. × 350.

time there is apparently no change in the amount of lignified tissue produced, but the ovule itself increases considerably in bulk.

What particular function these elements serve at this period in the development of the ovule is a matter for speculation. The presence of this specialised tissue round the micropyle certainly ensures that the pore will be preserved, but at the same time this pronounced metamorphosis of the apical cone of the inner

integument, at a relatively early stage in the development of the ovule, seems to imply a more definite purpose.

At a later stage the thick-walled tissue extends upwards in the inner integument, the large cells of the aqueous tissue becoming thick-walled and fibrous in character, this change in configuration extending gradually backwards to the base of the integument, until ultimately a compact fibrous testa is formed which completely envelops the seed. The fibres composing the testa are long, narrow, pitted elements, differing markedly from those of *Capparis*, which are extremely irregular in shape. The original thick-walled tissue developed in the region of the micropyle has now become sclerotic in character, but, as is also the case with the fibres of the rest of the testa, the protoplasmic

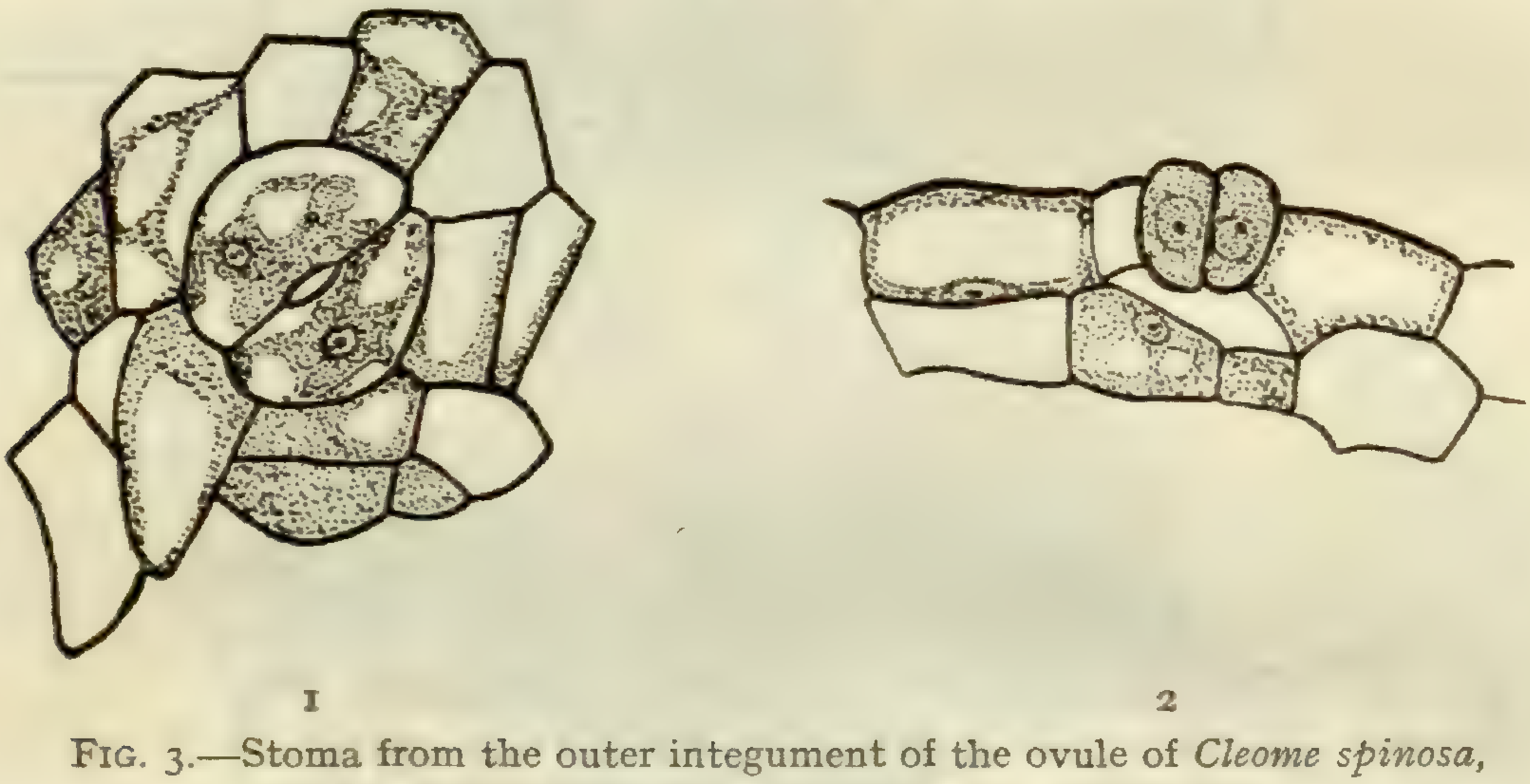

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FIG. 3.—Stoma from the outer integument of the ovule of *Cleome spinosa*, in (1) surface view, and (2) section. × about 500.

contents are still visible, and it is difficult to say definitely at what stage they disappear.

In the seed the function of this fibrous envelope is obviously that of protecting the embryo and preventing desiccation; but its genesis in the organic apex of the inner integument in the immature ovule, its interrupted development, and the retention of the living contents by the thick-walled cells round the micropyle all seem to predicate another function at the time of its inception.

In the mature ovule, as already indicated, the outer integument is double-layered, except at the micropyle, and in the outermost layer stomata occur. These stomata are comparatively numerous, and are identical with the similar organs in the leaf of *Cleome*. Where a stoma occurs, the two layers of the integument are separated, and an intercellular space is formed into which the stomatal pore opens, thus bringing the underlying tissue into direct communication with the ovarian cavity.

It may be noted in passing that stomata are also present in the inner ovarian wall in relatively large numbers.

The occurrence of stomata in ovules has been recorded by various authors—by Schleiden * in *Canna*, by Czech † in *Tulipa Gesneriana*, and by Guérin ‡ in *Dipterocarpus*, among others, but the physiological significance of their location in the ovule is not referred to.

If the outer integument be removed from living material and appropriately stained, the presence of conspicuous starch-grains in the guard-cells of the stomata, and in the cells of the underlying layer, can be clearly demonstrated. This fact is suggestive of the possibility of photosynthetic processes being carried out in the

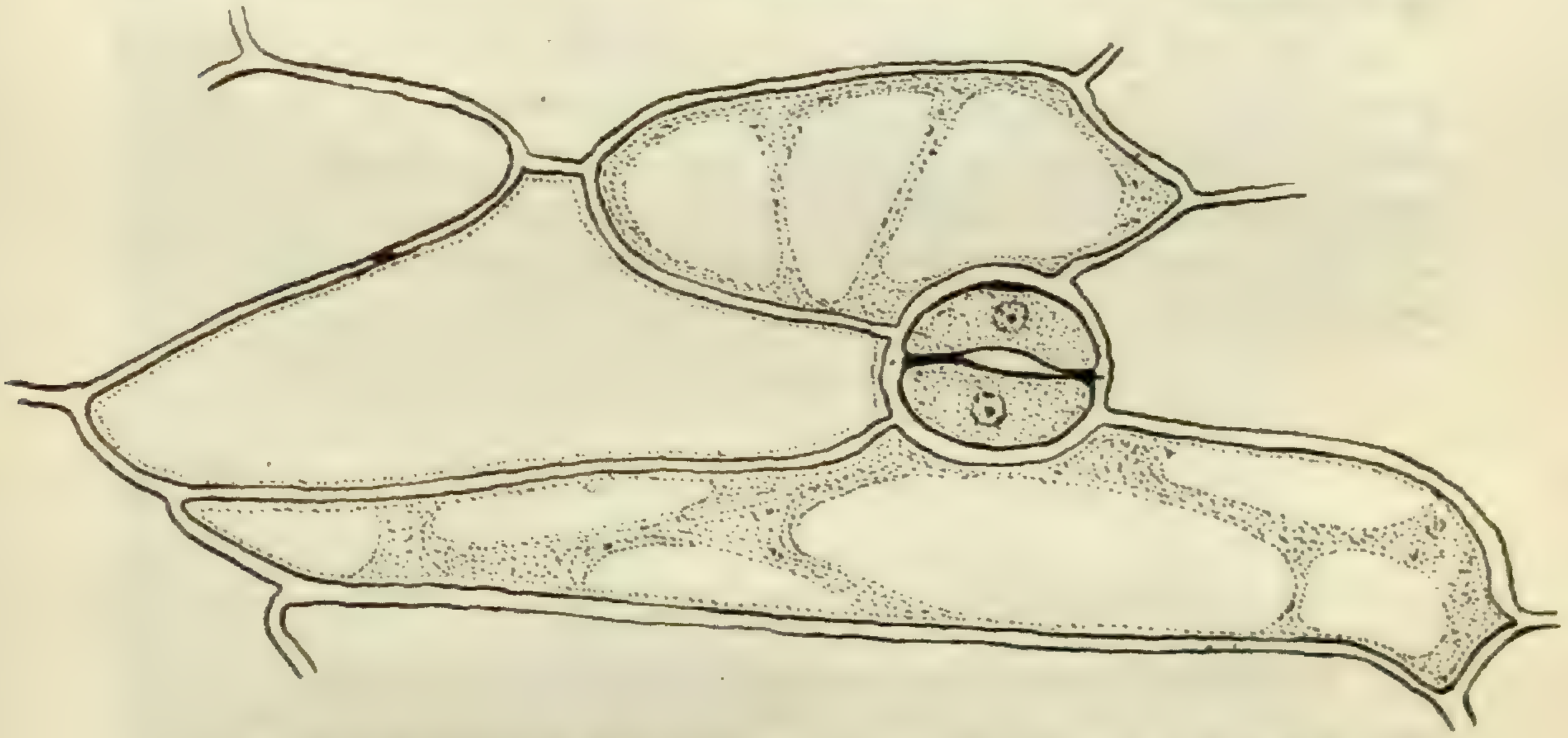


FIG. 4.—Stoma from the outer integument of the ovule of *Isomeris arborea*, in surface view. ×about 500.

ovule, though the quality of the light which filters through the ovarian wall must be appreciably diminished.

In the seed the outer integument becomes tubercled, the stomata then being found mainly on the multicellular excrescences. Starch-grains were again discernible in the guard-cells and in the cells of the hypodermal layer of immature seeds.

Isomeris arborea, Nutt.

The outer integument of the ovule of *Isomeris* is double-layered, as in that of *Cleome*, but the inner integument is many-layered, the aqueous tissue being two to three cells broad, while on its inner side there are four or five layers of smaller cells.

The fibrous layers have their origin in the same region as in

* M. J. Schleiden, Beitr. zur Botan. (1844), p. 10.
† Dr. Czech in Bot. Zeitg., xxiii (1865), p. 104.
‡ P. Guérin in Bull. Soc. Bot. Fr., lviii (1911), p. 12.

Cleome, but their subsequent development is more continuous, and, as might be expected from the greater size of the seed, the amount of fibrous tissue present is relatively increased. The fibres are larger in every way than in the preceding species, and they retain their protoplasmic contents even in the fully developed seed.

Stomata are present in the outer integument and are still evident in the seed condition, but the excrescences typical of the seed of *Cleome* are, of course, absent from the seed-coat of *Isomeris*. The inner walls of the ovary and fruit also possess numerous stomata, contrary to the statement of Briquet,* who, describing the inner fruit-wall of *Isomeris*, writes : " Il n'y a pas de stomates."

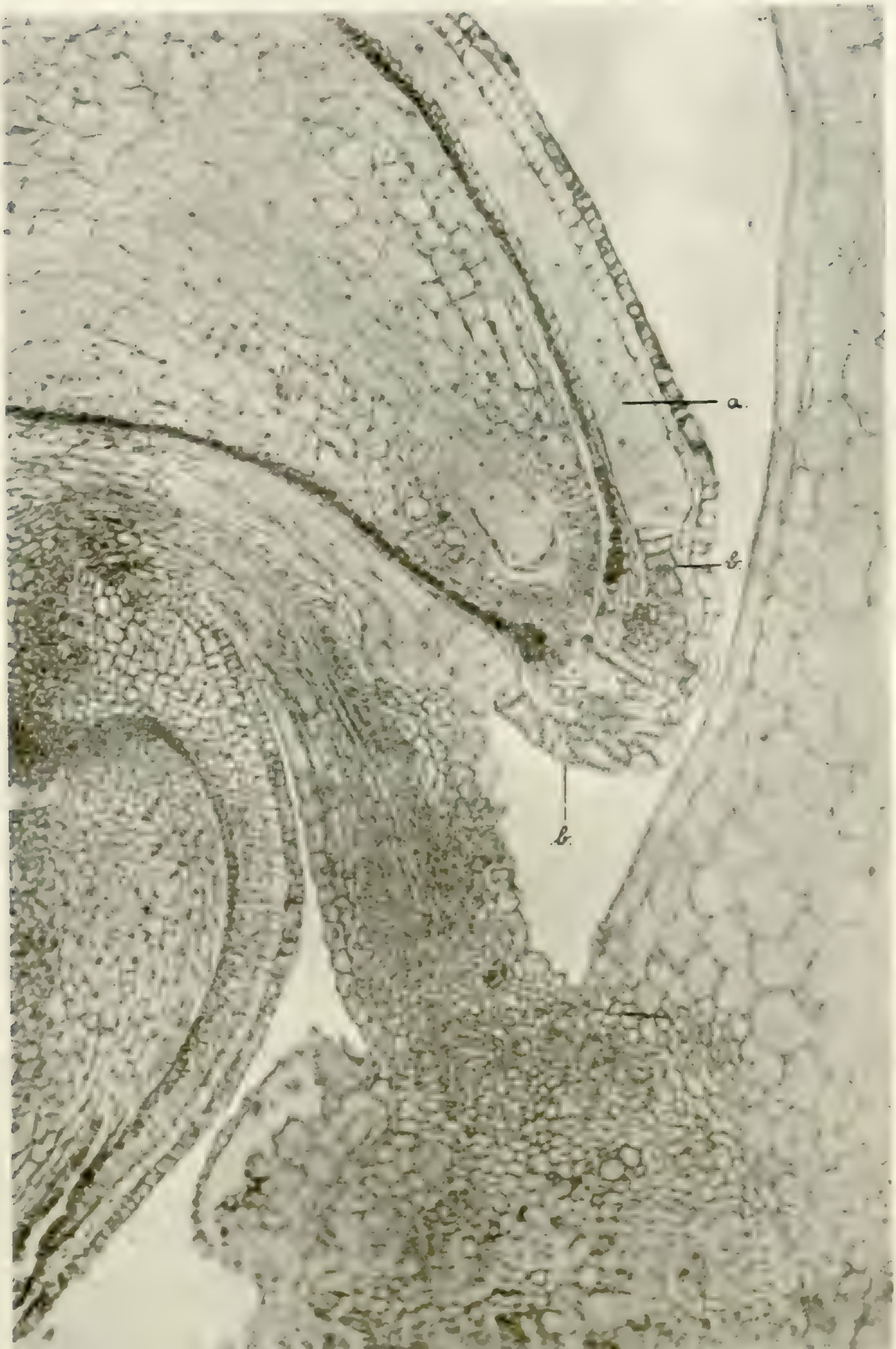
A further investigation of the ovular structure in other genera of the Capparidaceae may show that the features which characterise the ovules of *Cleome* and *Isomeris* are not confined to these genera alone. At the time, it was not possible to obtain suitable material for research, and this hypothesis still awaits confirmation.

* J. Briquet in Engl. Jahrb., l, Suppl. (1914), p. 440.

EXPLANATION OF PLATE CLXVII.

Illustrating Mr. M. Y. Orr's paper on Cleome and Isomeris.

Photograph of a longitudinal section of the ovule of *Cleome spinosa*. *a*, the aqueous layer in the inner integument; *b*, the lignified tissue round the micropyle.


a
b
b

The Occurrence of a Tracheal Tissue enveloping the Embryo in certain Capparidaceae.

BY

MATTHEW YOUNG ORR,

Assistant in Laboratory, Royal Botanic Garden, Edinburgh.

With four figures in the text.

THE ovules and seeds of the Capparidaceae have certain peculiarities of structure which, so far as is known, are not possessed by those families to which it approximates in systematic position, and one of the most striking is the presence in the seed, in some of the genera at least, of a highly specialised cellular tissue surrounding the embryo.

In ripe seeds this tissue is to be found adpressed to the inner wall of the testa, to the internal configuration of which it closely conforms, but from which it can be easily detached by careful dissection. On its inner side it is in close contact with the embryo, which it completely envelops.

In longitudinal sections of the seed this envelope or sheath has the appearance of an additional internal seed-coat,* and in some cases its intimate relationship to the included embryo is further emphasised by an infolding of the tissue between the radicle and the cotyledons.

When perfectly dry the whole envelope has an opaque, silvery appearance and can be easily distinguished from the dark-coloured testa, but when moistened it visibly expands and becomes transparent. Microscopic examination of this pellicle shows that it is composed of one or more layers of cells, which are differentiated in a remarkable way. The extent of this modification and the particular form it has taken vary in different genera, but its main features are more or less constant for each genus. The various types of envelopes will be described individually, but the distinctive features of this tissue and its possible function may be briefly referred to at this point.

In the seeds of the species examined, the layer, or layers, referred to above are composed of cells without protoplasmic contents, the walls of which elements are strengthened in various

* This third seed-coat is referred to by Baillon (Nat. Hist. of Plants, vol. iii, 1874, p. 152, note 1).

ways, giving to the tissue a distinctive appearance when viewed under the microscope. This thickening is in the form of annular and spiral bands or reticulations, which in some cases are found on the surface walls of the cells, and in others are confined to the lateral walls.

Such elements as those referred to above possess the form and structure of tracheides, indicating that the specialised layer surrounding the embryo is tracheal in character.

Such tracheal tissues are not entirely unknown in the seeds of living plants, for Beauregard * refers to a similar layer in his description of the seed of *Daphne*, and their presence in the seeds of certain other Thymelaeaceae was subsequently recorded by Guérin.† This latter author compared this pellicle with its tracheides to the tracheal sheath of the Cycadofilicales, but regarded it as representing in the Thymelaeaceae the vestige of a primitive structure.

In the Capparidaceae, such a tissue, with its different types of structure, suggesting separate lines of development within the family, would appear to be not merely vestigial, but actively functioning at some period in the growth of the seed.

Before the seed is liberated, the tracheal envelope is in close association with the vascular strand of the funicle, and may possibly function for a time at least as an accessory water-supply system for the embryo. On the other hand, its late development seems rather to imply that it plays a more important part in the economy of the seed at the time of germination. It is found that the apex of the tracheal sheath projects slightly into the micropylar pore, and, in the presence of moisture, its absorptive properties, already referred to, would ensure a supply of water being conveyed to all parts of the embryo, and especially to the radicle through the infolding of the envelope in that region.

It would appear, then, that in the seeds of the Capparidaceae the enveloping sheath acts as a sponge, absorbing moisture through the micropyle, and constituting a kind of "water-jacket" surrounding the embryo.

The investigation of the sheath characters of the different genera was carried out mainly on seeds taken from herbarium specimens, no other source of supply being available at the time, and there are of necessity numerous gaps in the sequence. A full list of the seeds examined will be found at the end of this paper, and when possible the actual specimen from which they were obtained has been indicated. The nomenclature followed is that contained in Bentham and Hooker's Genera Plantarum.

* M. Beauregard in Bull. Soc. Bot. Fr., xxiv (1877), p. 385.

† P. Guérin in C. R. Ac. Sc. Paris, clvi (1913), p. 398, and in Ann. Jard. Bot. Buitenzorg, ser. 2, xiv (1915), p. 1.

1. Cleomeae.

The three genera examined were *Cleome*, Linn., *Isomeris*, Nutt., and *Polanisia*, Rafin., and, as might be expected, their natural affinities are further emphasised by the similarity of structure found in the tracheal envelopes of their seeds. In the species examined, the tracheides are parenchymatous cells with delicate annular thickenings on their periclinal or surface walls, a feature which, so far as can be ascertained, is peculiar to the Cleomeae.

In many of the cells these fine bands of thickening are laid down in two, or even three, distinct concentric zones, and in

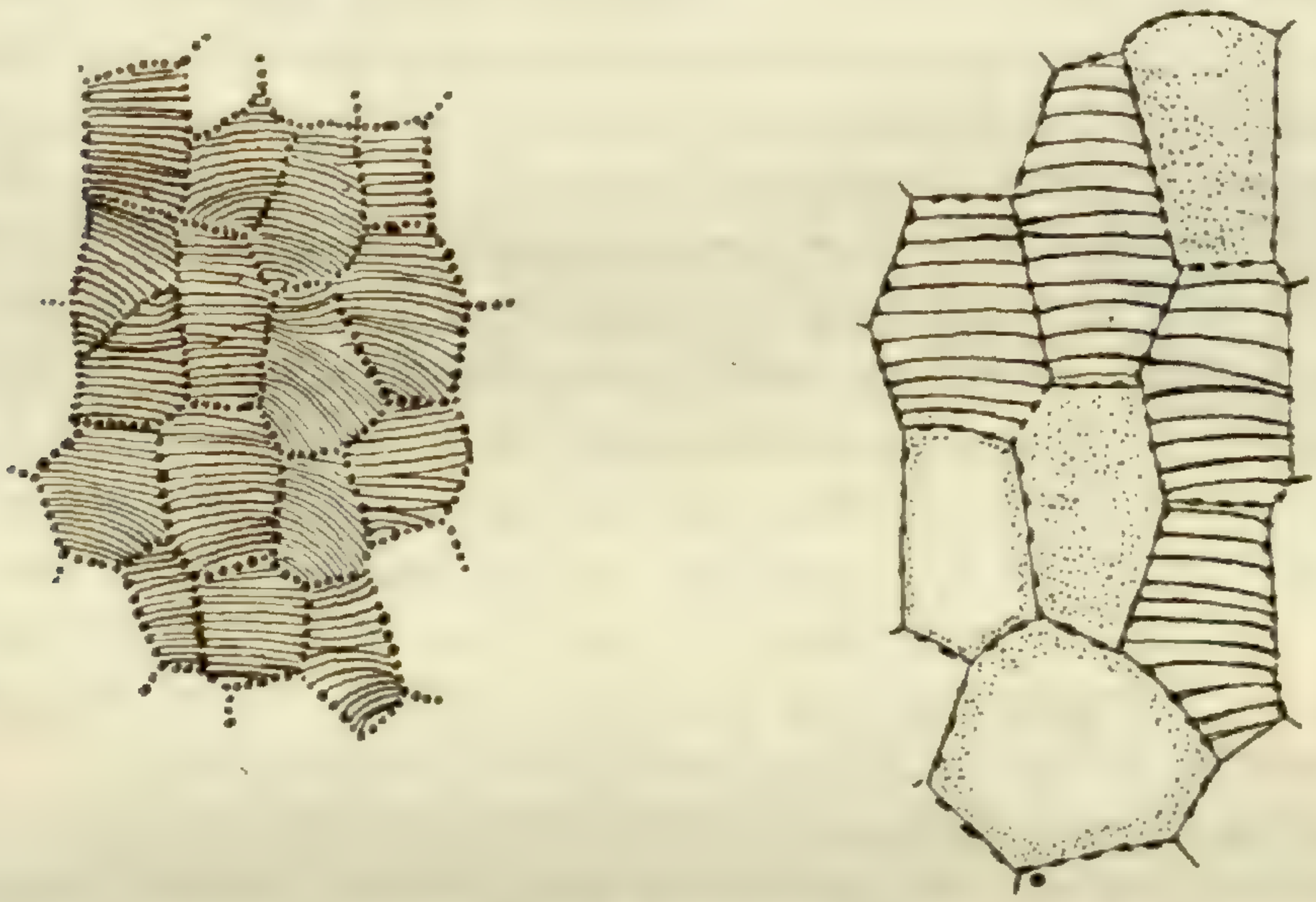


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FIG. 1.—A portion of the tracheal envelope of (1) *Cleome spinosa*, Jacq., and (2) *Isomeris arborea*, Nutt., in surface view. × 250.

surface view this conformation gives to the sheath a characteristic appearance.

Of the genera investigated, the tracheal envelopes of *Cleome* and *Polanisia* are identical in the configuration and size of the constituent elements, while *Isomeris* differs mainly in its larger tracheides. In some of the cells of the tracheal tissue of *Isomeris* protoplasmic contents were still visible, but this might possibly have been a transient condition due to the immaturity of some of the seeds examined.

The similarity of structure exhibited by the tracheal envelopes of these three genera is of special interest in view of their natural relationship and systematic position within the family. This raises the question of the possible value of this seed character, apart from its physiological significance, as an accessory factor in natural classification.

2. Cappareae.

Among the included genera of the Cappareae various types of tracheal envelopes are represented, differing in detail from one another, but all easily distinguishable from those of the genera already described in one definite feature. In *Cleome* and its allies the thickened bands are found on the periclinal or surface walls of the tracheides, and so are easily seen in surface view under the microscope; but in *Capparis* and its associates it is the anticlinal or lateral walls of the cells which are strengthened, while the surface walls remain unthickened. Notwithstanding the varieties of structure represented in the Cappareae, this anatomical feature would appear to indicate definitely the limits of each tribe, and to form a distinctive mark between them.

In the Cappareae this thickening of the anticlinal walls of the tracheides takes the form of spirals or reticulations, which, on account of their disposition, present an appearance in surface view of irregular lobes or protuberances on the lateral walls.* In many of the types this configuration is often the most characteristic, for, owing to the extreme shallowness of the cells, the fact that these lobes represent the end views of thickened bands, which are continuous to the base of the cell, can only be observed by careful focussing, or by means of sections. In other cases, and particularly in some species of *Capparis*, the depth of the tracheides is such that the slightest pressure is sufficient to bring the lateral walls into surface view.

In the figures illustrating the different types of envelopes, the thickening of the anticlinal walls as it appears in surface view has been indicated in each case, as this configuration seems to be more or less typical of each genus examined, and is expressive of the extent of the thickening over the surface of the walls, which cannot always be seen from this point of view.

Under *Capparis decidua*, Pax, a diagrammatic representation of an individual tracheid has been figured to illustrate the deeper type of element with reticulate thickening on its lateral walls. This deeper type of tracheid is best seen in *Capparis*, and the lateral walls can be easily flattened out, thus enabling the observer to determine the nature of the thickening. For this reason the sheath characters of this genus will be described first.

Capparis, Linn.

Among the different species of *Capparis* examined, both the deep and shallow types of tracheal elements are represented,

* The type of thickening found on the lateral walls of these elements in the Cappareae bears a marked resemblance to that figured by Guérin to illustrate his descriptions of the structure of the seed-coat in certain species of the Gentianaceae (Journ. de bot., xviii, 1904, pp. 37–52).

and the extent of the thickening of the tracheid walls is by no means uniform. It is therefore possible to classify them artificially for purposes of description on the basis of these minute structural differences.

1. The tracheal envelopes of *Capparis decidua*, Pax (*aphylla*, Roth), and *Capparis spinosa*, Linn., are composed of isodiametric cells with relatively deep anticlinal walls. In the case of *Capparis decidua* the anticlinal walls are closely reticulated, while in *Capparis spinosa* the thickening is more of a spiral conformation. Owing to the depth of the tracheides these anticlinal walls are easily seen in surface view, and the two types are readily distinguishable.

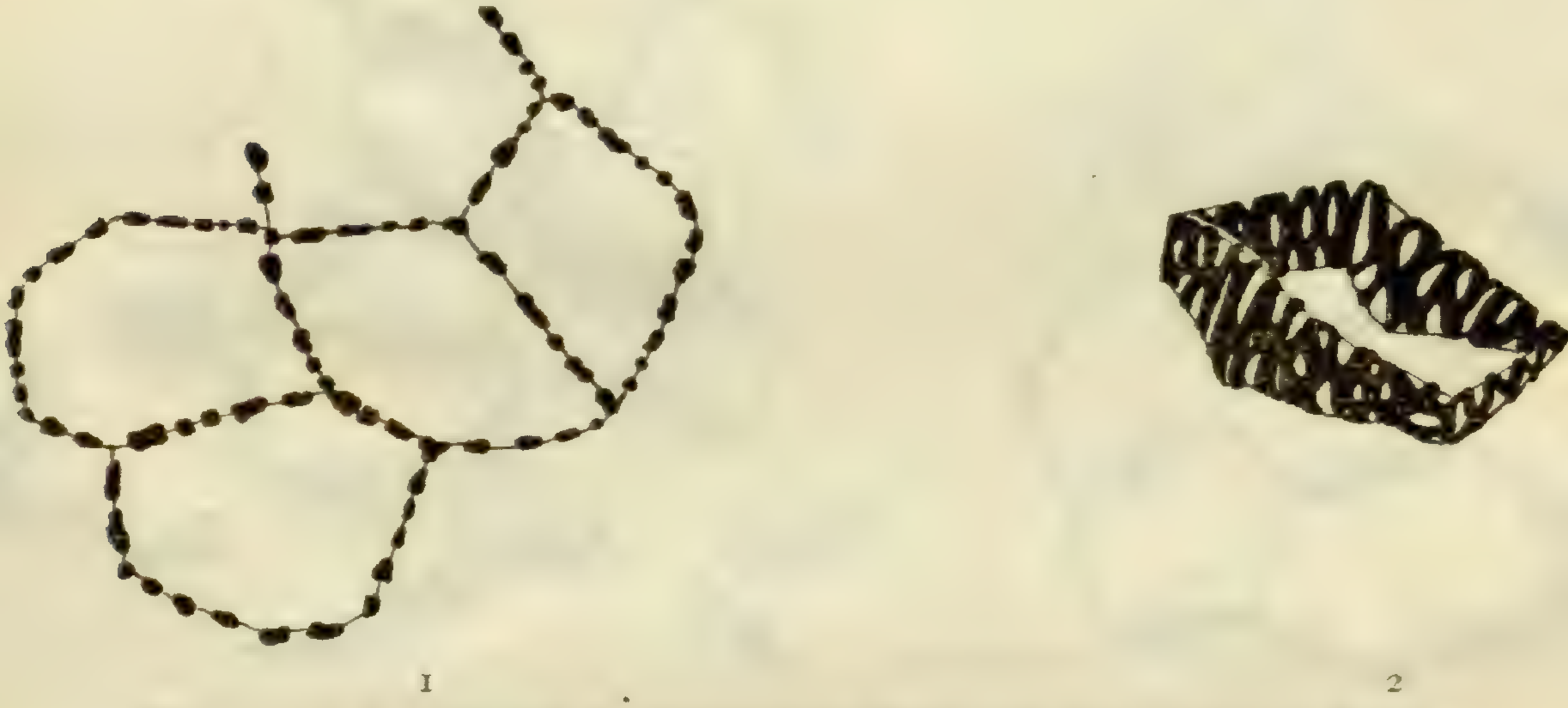

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FIG. 2.—(1) A portion of the tracheal envelope of *Capparis decidua*, Pax, in surface view. (2) Diagrammatic drawing of an isolated tracheid. × about 350.

In the remainder of the species the tracheal elements are much shallower, and the nature of the thickening cannot be so readily observed, nor does it appear to be uniform in the cells of any one species. In the portions of the tracheal envelopes which have been figured, the thickened lateral walls are shown as if in section, which is the most characteristic appearance presented by these sheaths in surface view. The irregular configuration distinguishes them definitely from the two species just described, and in some cases it more closely approximates to the type of structure found in allied genera. This diversity of sheath character within the limits of the genus is suggestive of its composite character.

2. Of the species possessing shallow tracheides, *Capparis micracantha*, DC., most closely resembles *Capparis decidua*. The tracheides are approximately the same size in surface view, but are of the shallow type, while the thickening is not so definite. The spirals on the lateral walls are broad bands, but in some elements they assume the form of a network. A somewhat

similar type of cell is found in the tracheal envelope of *Capparis xanthophylla*, Coll. et Hemsl., but in this species the lignification of the anticlinal walls is much more pronounced, and it is difficult to determine its features in surface view on account of the shallowness of the tracheides.

In *Capparis flavicans*, Wall., the tracheides are larger than those of the preceding species, and the lateral walls are so strongly thickened that in surface view an impression is given of a succession of unequal protuberances, projecting into the cell cavity. This marked configuration has been indicated in the figure below, but in actuality it represents the arrangement of the thickening on the surface of the lateral walls.

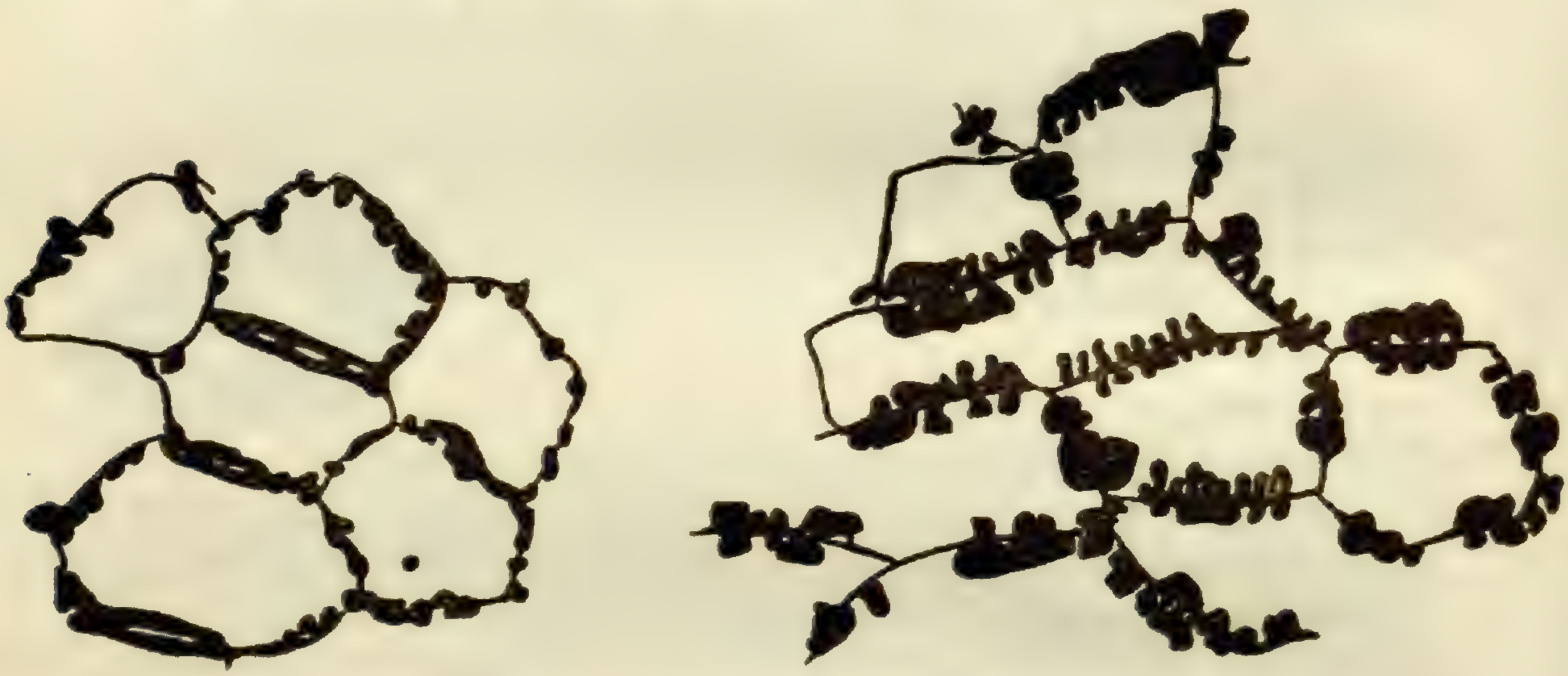

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FIG. 3.—A portion of the tracheal envelope of (1) *Capparis micracantha*, DC., and (2) *Capparis flavicans*, Wall., in surface view. × 350.

3. The structure of the envelope represented in *Capparis flexuosa*, Blume, is almost identical with that of *Apophyllum anomalum*, F. Muell. Both are composed of the same shallow type of tracheid with delicate spiral bands of the "spinosa" type on the lateral walls.

Apophyllum, F. Muell.

In this somewhat anomalous genus, represented by one species, the structure of the envelope surrounding the embryo closely resembles that found in *Capparis flexuosa*, referred to above. The lateral walls of the shallow tracheides are strengthened by fine spiral bands, and the whole sheath is mainly distinguishable from that of its *Capparis* prototype by the more rounded outline of the constituent elements. In general configuration it also approximates to the envelope of *Maerua*, from which it differs, however, in having only one layer of tracheides.

Maerua, Forsk., and **Niebuhria,** DC.

Between these two genera there is practically no distinction in the structure of the envelope. There are two superimposed layers of tracheides, deeper than those of the preceding species, and possessing bands of thickening somewhat similar to those found in *Capparis spinosa*, but not so clearly visible in surface view.

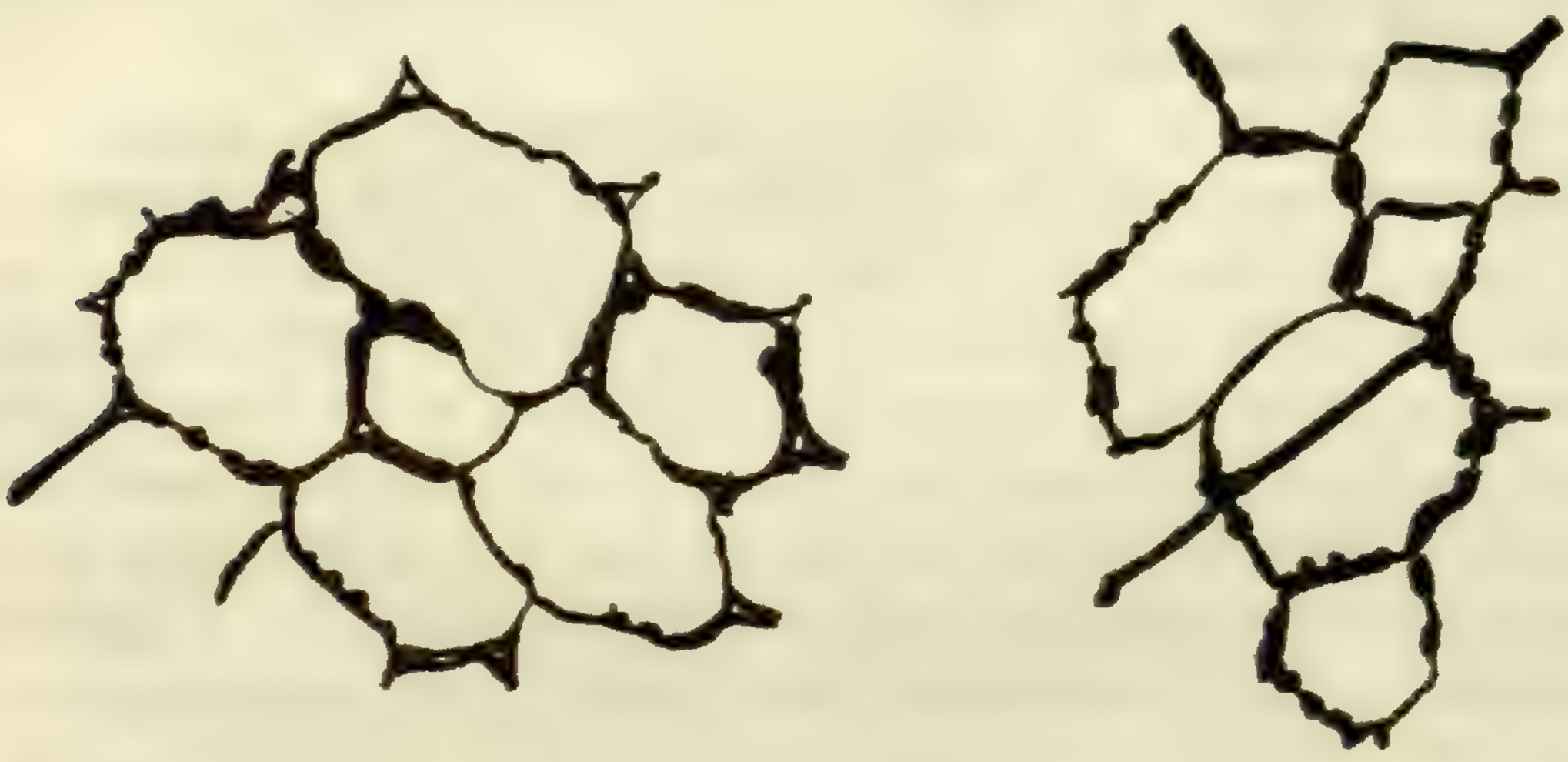

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FIG. 4.—A portion of the tracheal envelope of (1) *Apophyllum anomalum*, F. Muell., and (2) *Maerua parvifolia*, Pax, in surface view. × 350.

Crataeva, Linn., and **Euadenia,** Oliv.

These two genera are closely related, and in the characters of the tracheal tissue surrounding the embryo there is no distinction between them. In surface view the tracheal elements appear much larger in area than those described for other genera, but they are extremely shallow, and the irregular configuration of the lateral walls, which is such a distinctive feature in many types, is entirely absent. There is practically no indication of thickening on the walls when the sheath is examined in surface view, and it is only by means of pressure applied to the cover-glass, and careful focussing, that the fine annular bands are brought into view.

The presence of a well-defined layer of cells with thickened walls of a cellulose nature, underlying the tracheal tissue, is a characteristic feature of the enveloping sheath of these genera. This layer is evidently a store of reserve-cellulose destined for the use of the embryo.

It will be evident from the descriptions and figures of the tracheal envelopes found in the genera included under Cappareae that there is a considerable variation in the extent and arrangement of the thickening on the walls of the tracheides. This is

mainly a difference in degree, the varieties of configuration seen in the tissues in surface view being brought about by the varying depths of the tracheides, which accounts to a certain extent for the considerable lack of uniformity among the species of *Capparis*.

In minor details of structure the differences exhibited by the tracheal tissues are more often of the nature of generic distinctions. For example, in *Maerua* (sensu Pax) * the double layer of tracheides is distinctive, and has no parallel among the other types examined.

One feature is common to all the species investigated, definitely separating the Cappareae from the Cleomeae, and that is the localisation of the thickening on the anticlinal walls of the tracheides. In the Capparidaceae as a whole, the number of species examined is too small to admit of more than a passing reference to the speculative value of the sheath characters as an aid to classification. So far as can be ascertained, it does form a tribal distinction, and among natural allies it has every appearance of an additional link of some systematic import.

Apart from the phylogenetic aspect, the presence of the tracheal envelope in the seeds of the Capparidaceae is of much greater interest from a physiological point of view. Its structural features and position in the seed imply a relationship between this tissue and the included embryo which is not historical, but definitely functional, and apparently connected with the supply of moisture during germination. It is not confined to xerophylous species alone, although it reaches a high state of development in the seeds of such types.

It is possible that further researches may lead to a discovery of the existence of similar tracheal tissues in the seeds of other families besides the Thymelaeaceae and Capparidaceae.

In conclusion, I desire to express my indebtedness to Prof. W. G. Craib, for his valuable advice and criticism.

LIST OF SPECIES EXAMINED.

Cleome spinosa, Jacq.	Cult. Roy. Bot. Gdn., Edin.
,, *lutea*, Hook.	Idaho, Macbride, No. 226.
,, *platycarpa*, Torr.	California, Heller, No. 8010.
,, *Stocksiana*, Boiss.	Baluchistan (1889), Lace.
,, *gigantea*, Linn.	University Botanic Garden, Copenhagen.
Polanisia viscosa, DC.	N.W. Himal., Lace, No. 1188.
,, *cheledonii*, DC.	Siam, Khoon Winit, No. 458.
Isomeris arborea, Nutt.	Cult. Roy. Bot. Gdn., Edin.

* Pax in Engler u. Prantl, Pflzfam., iii, 2 (1891), p. 234.

Capparis spinosa, Linn.	Baluchistan (1888), Lace.
,, *decidua*, Pax (*aphylla*, Roth).	Baluchistan (1887), Lace.
,, *flavicans*, Wall.	Burma, Lace, No. 4879.
.. *xanthophylla*, Coll. et Hemsl.	Burma (1909), Lace.
.. *micracantha*, DC.	S. Siam, Mrs D. J. Collins, No. 7.
,, *flexuosa*, Blume.	Cult. Roy. Bot. Gdn., Edin.
Macrua parvifolia, Pax.	S. Africa, Dinter, No. 272.
Niebuhria siamensis, Kurz.	S. Siam, Mrs D. J. Collins, No. 4.
Apophyllum anomalum, F. Muell.	Australia.
Crataeva religiosa, Forst.	Sikkim.
,, *lophospermum*, Kurz.	Burma, Lace, No. 5354.
Euadenia eminens, Hook. f.	Cult. Roy. Bot. Gdn., Edin.

Since this paper was written, the author has had an opportunity of examining ripe seeds of species belonging to three additional genera of the Capparidaceae, viz. *Dactylaena micrantha*, Schrad., *Gynandropsis pentaphylla*, DC., and *Steriphoma cleomoides*, Spreng., the seeds of which were obtained from the University Botanic Garden, Copenhagen.

The tracheal envelopes of the species of *Dactylaena* and *Gynandropsis* are well defined, and have the characteristic structural features possessed by *Cleome* and *Polanisia*. Since these four genera belong to the Cleomeae section of the family, this similarity of structure serves to confirm the conclusion arrived at in the paper, namely, that the configuration of the tracheal envelope is a distinctive feature separating the Cleomeae from the Cappareae.

In the seed of *Steriphoma cleomoides* the sheath is of the shallow type, with delicate annular markings on the anticlinal walls of the tracheides. It most closely resembles that of *Macrua*, but consists of only one layer of tracheal elements. This apparent affinity corresponds with the position assigned to the genus in Bentham and Hooker's Genera Plantarum.

Intumescences on the Leaves of Marlea begoniifolia, Roxb.

Last summer my attention was drawn to the peculiar appearance presented by the leaves of a plant of *Marlea begoniifolia* growing under glass in the Royal Botanic Garden. On closer examination it was seen that the under surfaces of the leaves were studded with minute outgrowths, the largest barely exceeding 1 mm. in height. They varied in colour from the yellowish-green of the smaller swellings to the dark brown of the larger protuberances. They were absent from the upper surface, and were not observed on the other vegetative organs of the plant.

Microscopic examination of these structures showed that each had its origin immediately below a stoma. Division of the underlying cells of the mesophyll, accompanied by longitudinal division of the epidermal cells around the stoma, resulted in the formation of a hemispherical swelling, composed of thin-walled cells with vacuolated protoplasm and prominent nuclei, and enclosed by the extended epidermis, the stoma now being situated at the apex of the outgrowth, and completely occluded by the underlying compact tissue derived from the repeated division of the mesophyll elements. It is worth noting that although stomata are also present in the upper epidermis of the leaf, yet there was no hypertrophy of the tissues on that surface.

As the outgrowths increase in size they become lobed or branched, while the included elements are much elongated, with sparse protoplasmic contents and large vacuoles. At this stage the encompassing epidermal layer appears to have become disorganised, and the outline of each malformation is extremely irregular. Ultimately the outgrowths wither and die.

Intumescences resembling those found on *Marlea* have been recorded by Tomaschek * as occurring on *Ampelopsis hederacea*, while similar outgrowths in various plants have been described by Frank † and Sorauer.‡ More recently Miss Dale § has investigated very fully the nature and cause of the intumescences on *Hibiscus vitifolius*, and her conclusions as to the conditions favouring the production of the malformations suggest that the abnormal structures on the leaves of *Marlea* owe their origin to similar environmental conditions. A moist atmosphere, provided there is a sufficient temperature, seems to create a pathological condition inducing the formation of these outgrowths in *Marlea* as in *Hibiscus*; but, so far as is known, there has been no previous record of their occurrence in the former genus.

M. Y. O.

* A. Tomaschek in Oester. Bot. Zeitschrift, xxix (1879), p. 87.

† A. B. Frank, Krankheiten der Pflanzen, iii (1896), p. 313.

‡ P. Sorauer in Ber. Deut. Bot. Gesell., xvii (1899), p. 456.

§ E. Dale in Proc. Camb. Phil. Soc., x(1899), p. 192, and in Phil. Trans. Roy. Soc., Ser. B, cxciv (1901), p. 163.

Observations on the Structure of the Seed in the Capparidaceae and Resedaceae.

BY

MATTHEW YOUNG ORR,

Assistant in Laboratory, Royal Botanic Garden, Edinburgh.

With Plate CLXVIII.

THE presence of a specialised layer of distinctively marked elements, completely investing the embryo, is a characteristic feature in the seeds of certain Capparidaceae, and, in dissections of the seed of these genera which have been investigated, it has the appearance of a third seed-coat, internal to the fibrous tegmen.

The configuration of the thickened walls of the elements composing this enveloping sheath has been described elsewhere,* and it has been shown that, apart from its physiological significance, the localisation of the thickening bands on the periclinal or anticlinal walls of the constituent elements is capable of being regarded as a diagnostic feature, distinguishing the seeds of the two tribes of the Capparidaceae.

In the seeds of the Cleomeae the thickening is confined to the periclinal walls of the cells, and is in the form of delicate striations, which, when seen in surface view, produce the effect of finger-prints, such as are made use of in criminology. In the seeds of the Cappareae, on the other hand, the thickening bands are found only on the anticlinal cell walls, and present a totally different appearance when viewed under the microscope. This distinction is suggestive of the possible value of the features of the sheath from a systematic point of view.

Records of the occurrence of similarly constructed tissues in seeds are rare, but it was thought that, if the methods adopted in the investigation of the seeds of the Capparidaceae were applied to the seeds of allied families, details of structure which had hitherto been overlooked might be disclosed, and such features might possibly have some bearing on the phylogeny of the family.

On these lines, an examination of the seeds of representative genera of the Resedaceae was first undertaken, and it was observed that the tissue surrounding the embryo, which has the appearance of a third seed-coat, possessed those special features which characterise the corresponding tissue in the seeds of certain Capparidaceae.

* See p. 249.

The occurrence of a third seed-coat in the seeds of the Resedaceae is mentioned by Baillon * in his description of the seed of *Reseda odorata*, but no anatomical details are given. Mueller † in his monograph of the family, also briefly refers to this tissue, and it is indicated by Harz ‡ in his figure of a cross section of the seed of *Reseda lutcola*, but neither of these investigators makes any reference to the peculiar configuration of its periclinal cell walls, which is only visible in surface view.

For a description of the features of this differentiated tissue in the seeds of the Resedaceae, that of *Reseda glauca*, Linn., may be taken as typical of the family.

In dissections of the seed, it appears as a yellow pellicle, which adheres to the inner wall of the tegmen, and completely encloses the embryo. The cells of the outermost layer of this tissue are devoid of living contents, and are approximately .05 mm. long by .025 mm. broad.

In surface view, under the microscope, it is seen that their periclinal walls are clearly marked with numerous fine annular bands of thickening, producing the effect of finger-prints, and having the same appearance, but on a larger scale, as that presented by the corresponding tissue in the seeds of *Polanisia* and other genera belonging to the Cleomeae tribe of the Capparidaceae.

It is thus apparent that the seeds of those species of the Resedaceae and Capparidaceae which have been examined exhibit a striking similarity in their construction, for both families possess this unusual feature of a specialised tissue, forming a third seed-coat, the configuration of which, as seen in the seeds of the Resedaceae, is identical with that found in the Cleomeae among the Capparidaceae.

This anatomical feature has every appearance of an additional link between the two families, and, though it might be regarded as a minor character, its presence is nevertheless suggestive of the close affinity of the Resedaceae to the tribe Cleomeae of the Capparidaceae.

* M. Baillon, Natural History of Plants, vol. iii (1874), p. 206, footnote.

† J. Mueller, Monographie des Résédacées (1857), p. 59.

‡ C. D. Harz, Landwirthschaftliche Samenkunde (1885), vol. ii, p. 987.

EXPLANATION OF PLATE CLXVIII.

Illustrating Mr. M. Y. Orr's paper on the Structure of the Seed in the Capparidaceae and Resedaceae.

FIG. 1.—Photograph of a portion of the specialised layer surrounding the embryo in the seeds of *Polanisia viscosa*, DC. × about 430.

FIGS. 2 and 3.—Photographs of a portion of the corresponding tissue in the seeds of *Reseda glauca*, Linn. × about 430.

Some Fungi from Tibet.

BY

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Lecturer in Mycology in the University of Edinburgh.

With Plate CLXIX.

THE fungi described below were found on plants collected by Mr G. Forrest during July 1917 on the Mekong-Salween divide, in Tibet.

Aecidium sino-rhododendri, n. sp.

Maculis nullis. Aecidiis hypophyllis irregulariter dispositis, gregariis raro solitariis, pseudoperidiis cupulatis, albido-flavis circiter .5 mm. diam., breve cylindricis demum late apertis, margine lacero-dentato revoluto, aecidiosporis ellipticis, episporio dense verruculosis, 27–37μ × 20–25μ.

Hab. in foliis vivis *Rhododendri calvescentis*, Balf. f. et Forrest,* in S.E. Tibet. G. Forrest. No. 14,331. July 1917.

In the dried specimens the rather large white aecidia are very conspicuous on the brownish leaf (figs. 1 and 2, Plate CLXIX). A portion of the wall of the aecidiospore is smooth and thinner than the remainder (fig. 3). No spermogonia were found in the specimens.

With the exception of *Puccinia Rhododendri*, Fuck., a species with teleutospores only, occurring on *Rhododendron ferrugineum*, no species of *Puccinia* or *Uromyces* have been recorded on Rhododendrons. There is no information available regarding the other spore forms of *Aecidium sino-rhododendri*.

Labridium Rhododendri, n. sp.

Maculis epiphyllis griseis, orbiculo rufo-brunneo circumdatis, 1.5–3 mm. diam. Peritheciis gregariis vel sparsis, saepe confluentibus irregularibusque plerumque ellipsoideo-oblongis vel fusoideis, hysterioideis, rima longitudinali aperta, dimidiatis, .4–.9 mm. longis .3–.7 mm. latis, membranaceo-carbonaceis, textura solidiuscula, parenchymatica, subimpellucida, atro-

* "New Species of Rhododendron," Prof. Bayley Balfour, Notes from the Royal Botanic Garden, Edinburgh, No. 52–53, vol. xi (1919), p. 29.

fusca; sporulis oblongis, inaequilateralibus vel subcurvulis, 3-septatis, raro 4–5-septatis, ad septa paullo constrictis, castaneo-brunneis, ad apicem basemque cilio hyalino ad 35μ longo praeditis, 23–26$\mu \times 7$–8μ (sine ciliis) loculis ultimis minoribus; sporophoris simplicibus longitudine variabilis (ad 40μ), hyalinis, continuis.

Hab. in foliis vivis *Rhododendri calvescentis*, Balf. f. et Forrest,* in S.E. Tibet. G. Forrest. No. 14,331. July 1917.

The greyish-brown patches produced by this species on the upper surface of the leaf are directly opposite the groups of aecidia of *Aecidium sino-rhododendri* on the lower surface, and it appears possible that *Labridium Rhododendri* can only infect the leaf where the resistance of the tissues has been lowered by the presence of the *Aecidium*.

Only one other species of *Labridium* is known, *L. hians*, described by Vestergren in Sweden on *Potentilla reptans*.†

In the present species many of the pycnidia are irregular in form and partly confluent (fig. 4), but other simple types occur (B′, fig. 4) which resemble those of *L. hians* described by Vestergren. The dehiscence by a slit-like opening is very marked (fig. 5), the lips opening when moist and closing when dried. The spores are considerably larger than those of *L. hians*, but are similar in form (fig. 6). In view of the close agreement in spore form, the irregularity of many of the fructifications cannot be considered a character of sufficient importance to justify the exclusion of this species from the genus *Labridium*.

Puccinia Festucae, Plowr. Aecidia and spermogonia on *Lonicera Myrtillus*, Hook. f. et Thoms. var. On Ka-gwr-pw, Mekong-Salween divide. Lat. 28° 25′ N., alt. 14,000 feet. No. 14,419. G. Forrest. July 1917.

The species has not been previously recorded on this host.

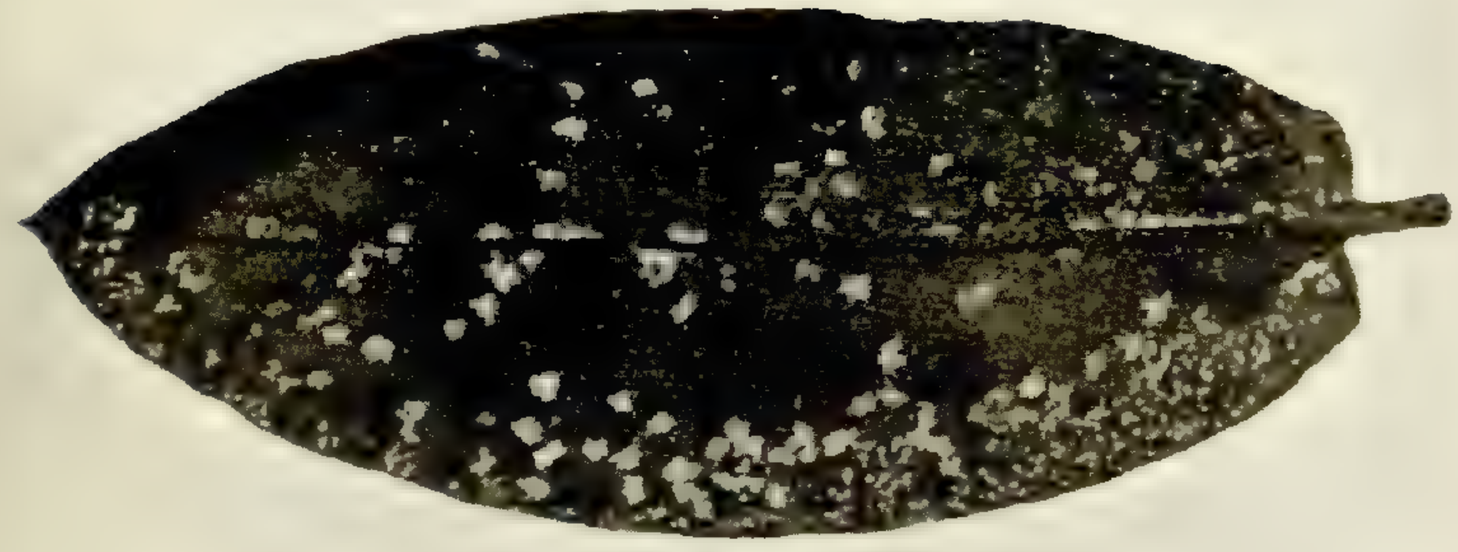
Epichloe sclerotica, Pat. On a grass, probably *Andropogon* sp. Hills around Tengyueh, Yunnan. Lat. 25° N., alt. 5300–6000 feet. No. 18,549. G. Forrest. Oct. 1919.

First recorded by Patouillard ‡ from Fac-Bin, Tonkin. As all the inflorescences are attacked and flower development prevented, exact identification of the host species is impossible. All the glumes are enclosed by a hard black stroma which closely simulates *Claviceps purpurea* in appearance.

* *Loc. cit.*

† Oefv. K. Vet. Acad. Förh., No. 1 (1897), p. 43.

‡ "Contributions à la Flore mycologique du Tonkin," Journ. de botanique, iv (1890), p. 65.



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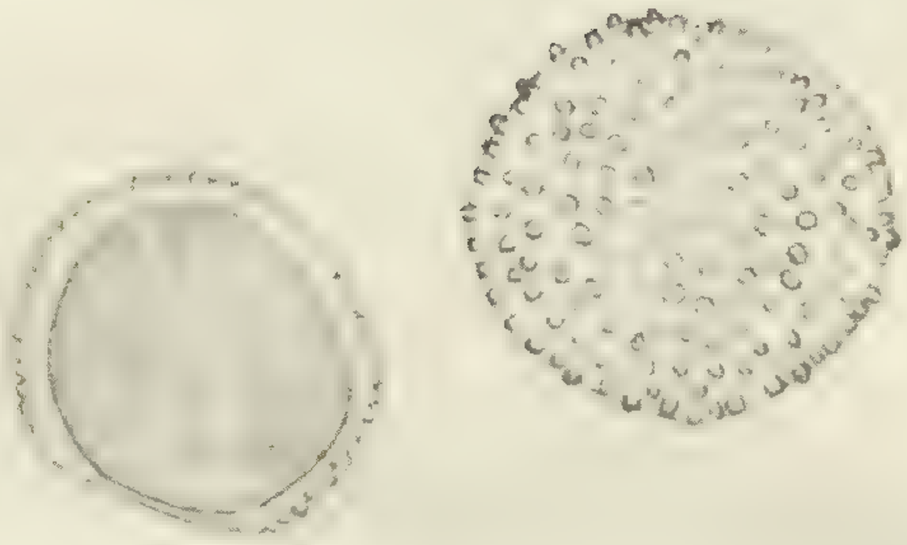

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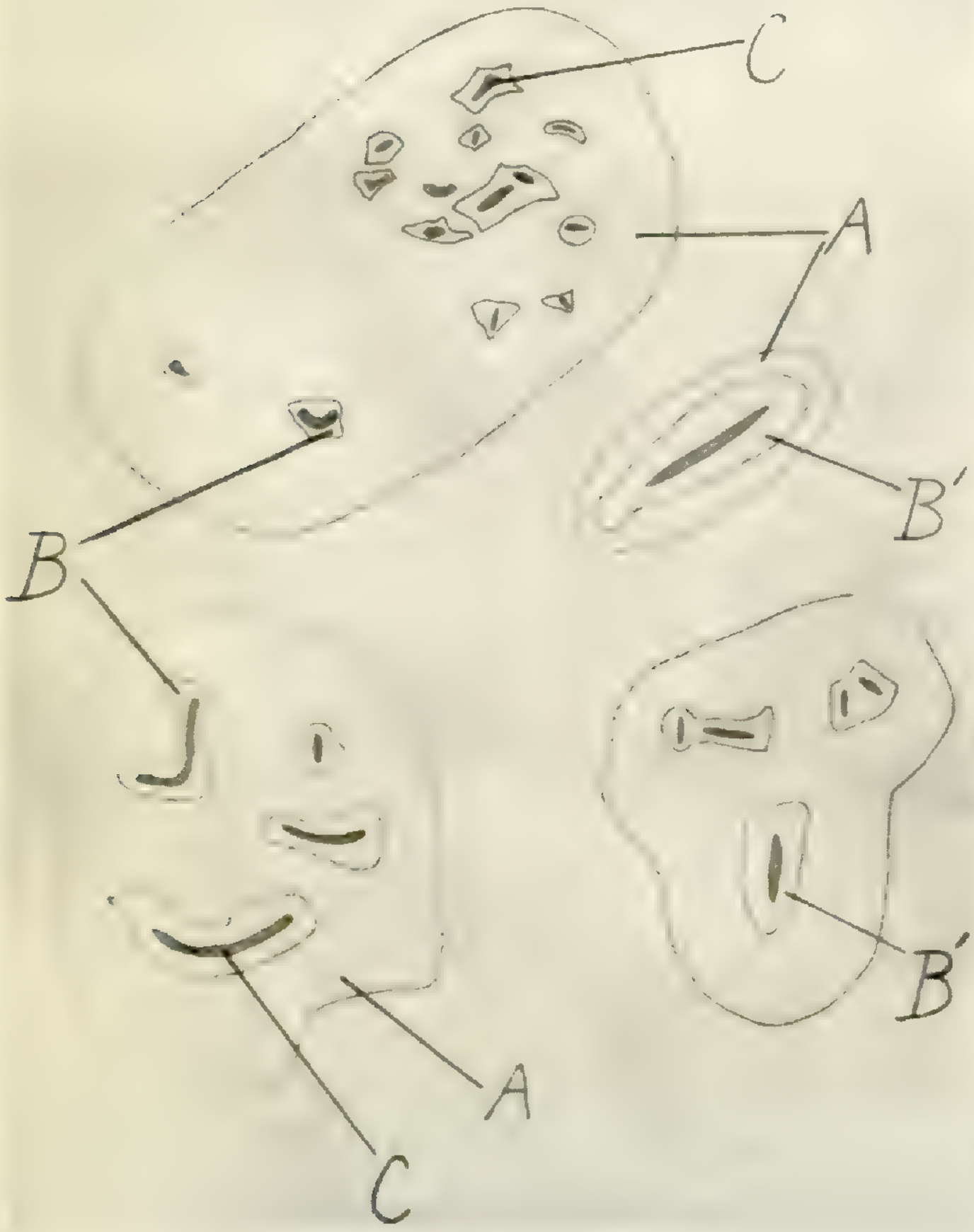

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EXPLANATION OF PLATE CLXIX.

Illustrating Dr. Wilson's paper on Some Fungi from Tibet.

FIG. 1.—Leaf of *Rhododendron calvescens* with aecidia of *Aecidium sino-rhododendri*. Natural size.

FIG. 2.—Groups of aecidia on leaf of *Rh. calvescens*. A, young unopened aecidia. × about 10.

FIG. 3.—Aecidiospores of *Aecidium sino-rhododendri*. × 495.

FIG. 4.—Plan of maculae and pycnidia of *Labridium Rhododendri* showing opening slits (shaded). A, macula; B, B′, pycnidia; C, slit. × about 15.

FIG. 5.—Transverse section of leaf of *Rh. calvescens* with pycnidium of *Labridium Rhododendri* showing dehiscence. × 125.

FIG. 6.—Spores of *Labridium Rhododendri*, the one on the left still attached to sporophore. × about 600.

An Addition to the Cryptogamic Flora of the Royal Botanic Garden.

BY

MALCOLM WILSON, D.Sc., and H. F. TAGG, F.L.S.

Physarum gyrosum, Rost.

Specimens of this organism, which belongs to the Mycetozoa, were found in a greenhouse in the Royal Botanic Garden in May 1919. The sporangia were discovered by Mr. Laurence Stewart amongst moss, on the surface of the soil in a pot in which seeds from India had been planted, and it is probable that the species was introduced with the seed.

The sporangia are clustered, and give rise to net-like plasmodiocarps several millimetres in diameter, which are seated on a dull red hypothallus; the sporangium wall is grey, with clustered deposits of white lime-granules. The capillitium forms a scanty network of hyaline threads with large lime knots; the spores are pale brownish-violet, spinulose, and 7–10 μ in diameter.

This species has not been previously definitely recorded in Britain. Berkeley probably found it in a cucumber frame in Northamptonshire, naming it *Didymium dædalium*, Berk. et Br., but the type specimen has not been preserved. The form described by Massee from a palm-house at Kew, and named *Physarum cerebrinum*, was also probably the same species.

Physarum gyrosum has been recorded from the Botanic Gardens at Berlin, from Ceylon, Japan, and from North and South America.

We desire to record our thanks to Miss G. Lister, to whom we are indebted for confirming the naming of *Physarum gyrosum* and for information concerning this species.

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[Notes, R.B.G., Edin., No. LX, January 1921.]

THE ROYAL BOTANIC GARDEN, EDINBURGH.

THE Royal Botanic Garden, Edinburgh, is one of three Gardens maintained by the State in the United Kingdom, the others being the Royal Gardens at Kew in England, and the Glasnevin Garden at Dublin in Ireland. It occupies an unequally-sided quadrilateral area of 57·648 acres (bounded upon all sides by public roads and dwelling-houses) on the north side of Edinburgh—about a mile from the shore of the Firth of Forth. Its highest point, at Inverleith House—the official residence of the Regius Keeper of the Garden—towards the north-west, is 109 feet above sea-level, and thence the ground falls away on all sides. The lowest point —a depression 48 feet above sea-level, with an east and west trend through the middle of the Garden—is the site of an old bog, and the ground rises again to the south of the depression. The surface soil is generally alluvial sand resting on clay at considerable depth. In the lower part of the area the clay comes to the surface.

There are two entrances to the grounds—one upon the east side from Inverleith Row into the **Garden,** the other upon the west side from Arboretum Road into the **Arboretum.** The entrance to the **Laboratories, Lecture Halls, Library,** and to the **Office** for Garden business is from Inverleith Row.

The **Garden** is open daily from **9 a.m.** on **Week-days** and from **11 a.m.** on **Sundays** until sunset.

The **Plant-Houses** are open from **1 p.m.** until **5 p.m.,** or until sunset if this be earlier.

The **Museum** is open on **Week-days** from **9 a.m.** until **5 p.m.** and on **Sundays** from **1 p.m.** until **5 p.m.**

The **Herbarium** is open on **Week-days** from **9 a.m.** until **5 p.m.,** excepting **Saturday,** when it is open until **1 p.m.**

The **Library** is open on **Week-days** from **9 a.m.** until **5 p.m.,** excepting **Saturday,** when it is open until **1 p.m.**

The **Office** for transaction of business with the Public and with Tradesmen is open on **Week-days** from **9 a.m.** until **5 p.m.,** excepting **Saturday,** when it is open until **1 p.m.**

[**Notes R.B.G., Edin., January 1921.**]
Wt. 11147/158—375—5/21.—N. & Co., Ltd. **Gp. 10.**
Wt. 14529/160—1000.

Staff of the Royal Botanic Garden, Edinburgh, at January 1921.

ESTABLISHMENT.

Regius Keeper	Isaac Bayley Balfour, K.B.E., M.A., M.D., F.R.S.
Assistant Keeper	William Wright Smith, M.A., F.L.S., F.R.S.E.
Assistant in Herbarium	William Edgar Evans, B.Sc.
Assistant in Laboratory	Matthew Young Orr.
Assistant in Library	James Todd Johnstone, M.A., B.Sc.
Assistant in Museum	Harry Frank Tagg, F.L.S.
Assistant in Studio	Robert Moyes Adam.
Head Gardener	Robert Lewis Harrow, F.R.H.S.
Plant Propagator	Laurence Baxter Stewart.
Typist	Jean Brockie.
Do.	Elizabeth Murdison Reid.
Medical Officer	Disney Cran, M.D.

Assistant Head Gardener	David Ramsay Oliver.
Foreman of Arboretum	Charles Lamont.
Foreman of Glass Department	James John Campbell.
Foreman of Herbaceous Department	Alexander M'Cutcheon.

RULES for the Royal Botanic Garden and Arboretum in connection with the Regulations prescribed by "The Parks Regulation Act, 1872."

1. No unauthorised Person may ride or drive in this Garden or in the Arboretum, and no Wheelbarrow, Truck, Bath-chair, Perambulator, Cycle, or other Vehicle or Machine, is allowed to enter, except with the written permission of the Keeper. Children under ten years of age are not admitted unless accompanied by a Parent or suitable Guardian.

2. No Horses, Cattle, Sheep, or Pigs are allowed to enter.

3. No Dogs are admitted.

4. No Bags, Baskets, or Parcels, no Flowers, and no implements for games may be brought in; Artists and Photographers may not bring in their Apparatus without written permission from the Keeper.

NOTE.—*The foregoing Rules shall not apply to persons going to or leaving Inverleith House by the road leading from the Arboretum Road Gate to the House.*

5. Visitors are to enter and leave the Plant-Houses by the Doors according to the Notices affixed thereon.

6. Smoking is not allowed in the Plant-Houses.

7. No Person shall touch the Plants or Flowers.

8. Picnics and luncheon parties are not allowed.

9. No unauthorised Person shall Drill or practise Military Evolutions or use Arms or play any Game or Music, or practise Gymnastics, or sell or let any Commodity.

10. No unauthorised Public Address may be delivered in the Garden or Arboretum. No Performance or Representation either spoken or in dumb show shall be given in any part of the Garden or Arboretum, unless by permission of the Commissioners of His Majesty's Works and Public Buildings. No Person shall use any obscene, indecent, or blasphemous words, expressions, or

gestures, or do any act calculated to provoke a breach of the Peace, in the course of, or in connexion with, any speech, address, performance, recitation, or representation. No money shall be solicited or collected in connexion with any performance, recitation, or representation, except by permission of the Commissioners of His Majesty's Works and Public Buildings.

11. Large parties must be broken up to prevent crowding.

12. Climbing the Trees, Railings, or Fences is forbidden.

13. Birds'-nesting, and taking, destroying, or injuring Birds or Animals are forbidden.

14. The distribution of Handbills, Advertisements, and other Papers by the Public is forbidden.

Dated the 28th day of April 1904.

Sealed with the Common Seal of the Commissioners of His Majesty's Works and Public Buildings.

SCHOMBERG K. M'DONNELL,
Secretary.

Seal.

Historic Notice.

In the year 1670 a small portion of ground, known as St. Ann's Yards, lying to the south of Holyrood House, and usually let to market gardeners by the Hereditary Keeper of Holyrood House, was occupied by two eminent Edinburgh physicians, **Andrew Balfour** and **Robert Sibbald**, for the making of a Physic Garden, and **James Sutherland** was appointed to the "Care of the Garden." This was the foundation of the Royal Botanic Garden of Edinburgh, which is therefore, after that of Oxford (founded in 1632), the oldest in Great Britain. The Garden was stocked with plants from the private Garden of Dr. Andrew Balfour, in which for some years he had been accumulating medicinal plants, and also in great measure from that at Livingston in West Lothian, the laird of which, Patrick Murray, was much interested in the growing of useful plants. Shortly thereafter, but at what precise date has not yet been ascertained, Sutherland became custodian of the Royal Garden, which lay on the north side of the Palace, and it became a Physic Garden for instruction, whilst the original plot in St. Ann's Yards was, apparently, given up.

In 1676 the same physicians acquired from the Town Council of Edinburgh a lease of the Garden of Trinity Hospital and adjacent ground for the purpose of a Physic Garden in addition to the Garden already existing at Holyrood, and they appointed the same James Sutherland (1639?–1719) to be "Intendant" of this Garden. The site of this Garden, which for convenience of reference may be called the Town's Botanic Garden, was the ground lying between the base of that portion of the Calton Hill upon which the prison is built and the North Bridge, and it is now occupied by a portion of the Waverley Station of the North British Railway. The name Physic Garden attached to a street in the vicinity is a reminiscence of the existence of the Garden at this spot.

About 1702 another Botanic Garden was established in Edinburgh in the ground immediately adjacent to the College

Buildings, apparently on the site of the present South College Street. This was the College Garden, and of it James Sutherland became also custodian.

Thus in the early years of the eighteenth century there were in Edinburgh three distinct Botanic or Physic Gardens—one at Holyrood, the Royal Garden; one around Trinity Hospital, The Town's Garden; and one beside the College, the College Garden—all under the care of James Sutherland.

Sutherland from the first made use of the Royal Garden for giving "instruction in Botany to the Lieges," and received a royal warrant appointing him Botanist to the King in Scotland, and empowering him to "set up a Profession of Botany" in this Garden. When the Town's Garden was created the Town Council appointed him to lecture on Botany as Professor in the Town's College, now the University of Edinburgh. In 1683 he published his "Hortus Medicus Edinburgensis, or a Catalogue of the Plants in the Physical Garden at Edinburgh," from which and from other published notices we learn that between two and three thousand plants were in cultivation. There are no data available from which to determinate how these plants were distributed between the several Gardens at the date of publication of Sutherland's catalogue.

In 1706 Sutherland resigned the care of the Town's Garden and the College Garden as well as his Professorship in the University, but, remaining King's Botanist, he retained the care of the Royal Garden at Holyrood. Charles Preston (1660–1711) was appointed his successor by the Town Council, and there were thus established rival Gardens and rival Professors of Botany in Edinburgh. Charles Preston was succeeded in 1712 in his offices by his brother George Preston (1659–1749). Neither of the Prestons had ever the care of the Royal Garden.

Sutherland's appointment as King's Botanist, Keeper of the Royal Garden, and Regius Professor of Botany was held during the pleasure of the Sovereign, and on the death of Queen Anne in 1714 he was not continued in office by George I.

In 1715 **William Arthur** (1680–1716) received a commission as successor to Sutherland, but as he was implicated in an unsuccessful Jacobite plot to seize the Castle, he did not hold the office long.

He was succeeded in 1716 by **Charles Alston** (1685–1760).

In 1724 the College Garden, having fallen into disorder, was turned to other uses; and in 1729, George Preston having retired, the Town Council appointed, as his successor in the charge of the Town's Garden and as Professor of Botany in the University, Charles Alston, who as King's Botanist had already the charge of the Royal Garden and was Regius Professor of Botany. Through him, after separation for a quarter of a century, the Royal Garden and the Town's Garden were again combined under one Keeper, and the Regius Professorship of Botany and the University Professorship were similarly united. They have so continued to the present time.

In 1763, the Royal Garden and the Town's Garden proving too small and otherwise unsatisfactory, **John Hope** (1725–1786), who had succeeded Alston in his offices in 1761, proposed a transference of the two to a more congenial site in which they could be combined. At first it was intended to secure ground to the south of George Watson's Hospital—the area upon which much of the present Royal Infirmary is built—but this not being possible, five acres of ground to the north side of Leith Walk, below the site now occupied by Haddington Place, were chosen. As Hope proposed to transfer the collections in the Royal Garden to the new Garden he was able to secure the support of the Treasury to his scheme, and the selected ground was leased in name of the Barons of Exchequer. At the same time the Town Council agreed to contribute £25 annually to the support of the Garden, the sum being the amount of rent expected from the letting of the old Town's Garden. The plants from both Gardens were transferred to the ground at Leith Walk, and from this date there has been only one Botanic Garden in Edinburgh. The site thus secured for the Garden proved, however, only a temporary one.

Daniel Rutherford (1749–1819), who in 1786 succeeded Hope in his offices, cast about him for a spot in which more ground would be available for the extension of the Garden; and eventually in 1815 nine and a half acres of the land lying to the east of Holyrood Palace, and forming the ground of Belleville or Clockmill, was fixed upon as a site. This selection gave rise to controversy, which was prolonged, and Rutherford

died before any arrangements for the transference of the Garden had been made.

Robert Graham (1786–1845), his successor, appointed in 1820, preferred the more open site of the Inverleith property which the Garden now occupies, and fourteen acres of the Field or Park of Inverleith, known as Broompark and Quacaplesink, were purchased by the Barons of Exchequer from Mr. James Rocheid, its owner, in 1820, the lease of the Leith Walk Ground being sold. By 1823 all the plants had been transferred to the new Garden.

In 1858, during the Keepership of **John Hutton Balfour** (1808–1884), who succeeded Graham in 1845, a further addition, by purchase from the proprietor of Inverleith, of a narrow belt of two and a half acres was made to the Garden on the west side; and in 1865 the Caledonian Horticultural Society having resigned to the Crown its lease of the ten acres of adjoining ground which it had occupied since 1824 as an experimental Garden, this ground was also made part of the Botanic Garden. Finally the present area of the Garden was completed in 1876, when the Town Council purchased from the Fettes Trustees twenty-seven and three-quarter acres of Inverleith property on the west side of the Garden and transferred it to the Crown for the purpose of making an Arboretum in connection with the Garden; the Crown at the same time purchased Inverleith House and two and a half acres of additional ground.

In 1879, **Alexander Dickson** (1836–1887) became Queen's Botanist, Regius Keeper and Professor, and held these appointments until his death in 1887. During his term of office the Arboretum was opened to the public.

Regius Keepers (R.K.)
from the date of
Foundation of the Garden.

JAMES SUTHERLAND . . .	Born 1639? R.K. 12th January, 1699.* Not confirmed, 1714. Died 24th June, 1719.
WILLIAM ARTHUR . . .	Born September, 1680. R.K. 10th May, 1715. Died 1716.
CHARLES ALSTON . . .	Born 24th October, 1685. R.K. 30th June, 1716. Died 22nd November, 1760.
JOHN HOPE	Born 10th May, 1725. R.K. 13th April, 1761. Died 10th November, 1786.
DANIEL RUTHERFORD . .	Born 3rd November, 1749. R.K. 20th December, 1786. Died 15th December, 1819.
ROBERT GRAHAM . . .	Born 7th December, 1786. R.K. 31st January, 1820. Died 7th August, 1845.
JOHN HUTTON BALFOUR . .	Born 15th September, 1808, R.K. 8th November, 1845. Retired, 1880. Died 11th February, 1884.
ALEXANDER DICKSON . .	Born 21st February, 1836. R.K. 28th April, 1880. Died 30th December, 1887.
ISAAC BAYLEY BALFOUR . .	Born 31st March, 1853. R.K. 5th April, 1888.

* This is the date of a Royal Warrant from William III., and no earlier one has been found.

Principal Gardeners (P.G.) from the Year 1756.

(The Names of those preceding Williamson are not yet known.)

JOHN WILLIAMSON . . .	P.G. 1756? Died September, 1780.
MALCOLM M'COIG . . .	P.G. 1st January, 1782? Died 25th February, 1789.
ROBERT MENZIES . . .	P.G. 1st October, 1789. Died 22nd January, 1800.
JOHN MACKAY . . .	Born 25th December, 1772. P.G. February, 1800. Died 14th April, 1802.
GEORGE DON	Born October, 1764? P.G. 1st October, 1802. Resigned 31st December, 1806. Died 15th January, 1814.
THOMAS SOMMERVILLE . .	Born 1783? P.G. 1807? Died 17th March, 1810.
WILLIAM M'NAB . . .	Born 12th August, 1780. P.G. April, 1810. Died 1st December, 1848.
JAMES M'NAB. . . .	Born 25th April, 1810. P.G. 1st January, 1849. Died 19th November, 1878.
JOHN SADLER	Born 3rd February, 1837. P.G. 13th January, 1879. Died 9th December, 1882.
ROBERT LINDSAY . . .	Born 7th May, 1846. P.G. 3rd March, 1883. Retired 31st March, 1896. Died 24th September, 1913.
ADAM DEWAR RICHARDSON .	Born 12th September, 1857. P.G. 1st April, 1896. Resigned 31st May, 1902.
ROBERT LEWIS HARROW. .	Born 26th March, 1867. P.G. 1st June, 1902.

Features of the Garden.

THE method through which the Garden was built up by successive additions resulted in an absence of combination between its several parts, in great measure a consequence of want of adequate funds to make the necessary alterations in the grounds. During the past thirty-two years, in which the Garden has been wholly under the administration of the Commissioners of H.M. Works, the bringing about of this combination has been in progress. The work is not yet completed, and the Plan of the Garden which is attached to this sketch shows the area of the Garden as it is laid out at this date—January 1921. Future editions will show further changes as the work of reconstruction proceeds.

From its foundation the Botanic Garden has been devoted to the teaching of Botany, and its usefulness in this respect has determined the laying out of its area.

Herbaceous Garden.—A considerable space is occupied by a collection of herbaceous plants arranged for study in natural orders.

Rock Garden.—There is an extensive rockwork upon which alpine and rarer herbaceous plants are cultivated.

Arboretum.—The whole of the western area of the Garden is in process of arrangement as an Arboretum of trees and shrubs, and the positions of some of the chief genera are indicated on the plan. The Coniferæ are now placed in the ground adjacent to the Rock Garden.

Herbaceous Border.—Along the North Boundary of the Arboretum a mixed Herbaceous Border has been planted.

The **Plant-Houses** are still in process of reconstruction. So far as they have been rearranged at the present time they consist of a long range to the north of the herbaceous collection, composed of a Central Green-house (**C**), from the sides of which two Corridors run east and west. In the Entrance Porch (**D**) to the Central Green-house is a collection of Insectivorous Plants. From the Eastern Corridor two houses project to the south—one (**A**) occupied by plants of Dry Regions, the other (**B**) containing

Economic Plants of both Tropical and Temperate Regions. Ending the Corridor is a house (**AA**) occupied by Rhododendrons and other Temperate Shrubs and Trees; opening from it are houses (**BB** and **CC**) in which an indoor rockery has been built for Rock Plants which do not thrive in the open. To the south side of the Western Corridor are attached two houses—one (**E**) for Orchids and one (**F**) for Plants of Tropical and Warm Regions. The western end of the Corridor opens into a domed house (**G**) for Ferns of Tropical Regions which are planted out, and attached to it are two houses running southwards, one of which (**H**) is occupied by Tropical Plants, and the other (**I**) is used for Heaths and Hardwooded Plants. From the northern wing of this domed house opens a house (**J**) devoted to monocotylous Plants of Tropical and Warm Regions, specially Aroids, Scitamineæ, Liliaceæ, and Amaryllidaceæ. Out of this opens the house (**K**) for Bromeliads; and in another house (**L**) opening from this are Pitcher Plants. Behind the western end of the Front Range there is a Temperate House (**M**) for Palms, Tree-Ferns, and Coniferæ, and a Palm-House (**N**).

Adjoining Inverleith Row is a group of buildings including the **Museum** (**O**), the **Laboratories** (**P**), the **Lecture Hall** (**Q**), the **Library** (**R**), and the **Office** (**Y**), for transaction of business with the Public.

The **Museum** contains a series of exhibits illustrating the form and life-history of plants, and these are arranged so as to facilitate their use in teaching.

The **Library** contains over sixteen thousand volumes. The leading botanical and horticultural periodicals are taken and may be consulted like the other books by the public. Books are not lent from the Library.

Herbarium.—In the southern portion of the Garden is the Herbarium (**S**). It contains a fair representation of the Floras of the world.

Ladies' Cloak-Rooms are at (**T**) and (**T**). **Gentlemen's Lavatories** will be found at (**V**) and (**V**).

From the higher ground of the Arboretum—at the point marked (**X**) on the plan—a fine panoramic view of the City of Edinburgh, flanked on the east by Arthur's Seat, and on the west by the Pentland Hills, is obtained.

Teaching in the Garden.

IN the year 1892 the Board of Agriculture, then recently established in England, assigned a small grant to the Royal Botanic Garden towards the institution of a Course of Instruction in the Sciences underlying the Practice of Horticulture and Forestry for the benefit of young men and women desiring to become Gardeners and Foresters. The fact deserves record, because it marks the introduction in Scotland of a systematised effort to provide scientific instruction to practical men in Gardening and Forestry.

The Course of Instruction has been carried on since. The following schedule—copies of which may be obtained by application to the Regius Keeper—indicates the terms upon which young men and women are at present admitted to the Course :—

Admission of Probationers.

1. The First Commissioner of His Majesty's Works is willing to consider applications from young men and women intending to become Gardeners or Foresters who may wish to serve for a period in the Royal Botanic Garden, Edinburgh.

2. The number of young men and women who can be so admitted is limited.

3. Such entrants will be in the position of Probationers, as a special class in the service of the Garden. Their work will be such as may be assigned to them, and they will work under all the regulations in force in the Garden.

4. Applicants must be unmarried and not over 25 years of age.

5. Each Applicant must furnish a medical certificate of fitness and a recommendation and certificate of character from a person of position to whom the Applicant is well known, and if the Applicant is or has been previously in a situation, a certificate from the present or last employer must be forwarded. Applicants who have had practical experience in Gardening or Forestry must state the amount of this and also if they have had experience of cultivation of plants under Glass.

6. Probationers will have the opportunity of attending a Course of Instruction in the Sciences underlying the practice and

the principles of Horticulture and Forestry free of charge, and they must attend the course, and also use the Library and Reading Room of the Garden. The subjects of Instruction, which are arranged in a curriculum extending over from two and a half to three years, are :—Botany, Chemistry, Entomology, Geology, Meteorology, Physics, Surveying and Mensuration, Field Engineering, Bookkeeping, Horticulture, and Forestry, and these are taught practically as far as possible.

7. At the conclusion of the Course of Instruction the Probationer will in ordinary course give place to a new entrant.

8. Any Probationer who does not show satisfactory progress in studies, or who does not give satisfaction otherwise, will be removed.

9. A grant in aid (subsistence allowance) will be given to each Probationer. The amount given to a Probationer at admission will depend upon his or her age, experience, and capacity. The minimum will be at the rate of ten shillings a week, and the maximum at the rate of twenty-one shillings a week. In addition there is at this date (1921) a war-bonus. Probationers who receive at entrance less than the maximum may, after admission, receive increments in relation to fitness and merit alike in the work of the Garden and in the Course of Instruction.

10. Holiday leave to the amount in all of eight working days in the year, in addition to Christmas Day, New Year's Day, Victoria Day, Spring and Autumn Holidays, is allowed after six months' service.

11. Probationers may be called upon to work on Sundays, and will receive remuneration for such work on a recognised scale.

12. Men Probationers will wear when at work a grey flannel shirt with turn-over collar of the same material, and a blue serge suit of clothes; in the Glass and Herbaceous Departments an apron after pattern at the Garden must be worn.

13. Applicants must distinctly understand that the times of duty of Probationers are such as may be necessary, that admission as a Probationer is only an ordinary weekly hiring subject to a week's notice from any day, and subject to instant dismissal in case of misconduct, with subsistence allowance up to date of dismissal only, and does not entitle to any superannuation or to any compassionate or other allowance at the termination thereof,

excepting such allowance or gratuity as might be awarded under the Superannuation Act, 1887 (Secs. 1 and 4), or any Act or Acts amending the same. Further, in the event of any injury happening to a Probationer in respect of which compensation would be payable under the Workmen's Compensation Act, 1906, any sick pay which may be granted will be inclusive of such compensation payable under the Act in question, and an amount equivalent to such compensation will be deducted from any payment to dependents should the injury terminate fatally.

14. Young men or women desiring admission as Probationers must fill up, in their own handwriting, the form below, and return this paper addressed to

THE REGIUS KEEPER,
ROYAL BOTANIC GARDEN,
EDINBURGH.

15. Applicants will be informed if their names have been entered for admission, and on a vacancy occurring will receive notice thereof. Should there be no vacancy within six months from the date of application, it must be renewed if the Applicant still desires to work as a Probationer in the Royal Botanic Garden. If not renewed, the applicant's name will be removed from the waiting list.

16. The First Commissioner desires to impress upon applicants that he grants this privilege in the expectation that Probationers will earnestly endeavour to make use of and profit by the opportunities of acquiring knowledge placed within their reach, and will recognise that it is incumbent upon them at the same time to perform with zeal the duties assigned to them.

Form to be filled up by Applicants for Admission as Probationers in the Royal Botanic Garden, Edinburgh.

Name of Applicant

Address

Date of Birth

Birthplace

Forester or Gardener

Name and address of present (or last) employer

Length of time in present situation

Previous situations and length of time in each (Gardeners to state amount of their experience in cultivation of plants under Glass)

Signature of Applicant _____

Date _____

Lectures to the Public.

The Regius Keeper from time to time gives lectures which are open to the public.

Research.

The **Laboratories** are open to anyone desirous of undertaking Botanical Research.

Specimens for Private Study.

Specimens for private study are supplied, as far as the resources of the Garden will permit, to visitors, teachers, and students who make written application to the Regius Keeper. Application forms may be obtained at the office of the Garden.

Plants and Seeds are not Sold from the Garden.

Publications.

In 1900 appeared the first number of *Notes from the Royal Botanic Garden, Edinburgh*, for the purpose of publishing reports upon the conditions and progress of the Garden, records of scientific investigations carried on in the Garden, and notices of matters of interest relating to plant-life which have come under the observation of the Staff. The *Notes* are available in exchange for publications of kindred institutions, and are on sale at the gates of the Garden and may be purchased either directly or through any Bookseller from H.M. Stationery Office (Scottish Branch), 23 Forth Street, Edinburgh. The parts are not issued at fixed periods. Twelve volumes have been completed.

A short descriptive *Sketch of the Garden* may be purchased at the gates.

A **Seed List** containing the names of plants cultivated from which seeds have been collected during the year is published in December. The seeds are available for exchange.

Botanical Department
of the
University of Edinburgh.

DURING nearly two centuries the offices of Regius Keeper of the Royal Botanic Garden and Professor of Botany in the University of Edinburgh have been held by the same person, and it has become the custom that the students of the University come to the Garden for instruction in Botany. The whole work of the Botanical Department of the University is carried out in the Garden by the University Staff, which at this date is constituted as follows :—

Professor of Botany	Isaac Bayley Balfour, K.B.E., M.A., M.D., F.R.S.
Assistant and Lecturer on Botany .	James Robert Matthews, M.A., F.L.S.
Assistant and Lecturer on Forest Botany	James Lindsay Salmond Smith, M.A., B.Sc.
Assistant and Lecturer on Mycology	Malcolm Wilson, D.Sc., F.L.S., F.R.S.E.
Assistant and Lecturer on Plant Physiology	James Templeton, B.Sc.
Assistant and Tutor in Botany .	Mary Bartholomew, B.Sc.

Enumeration of Visitors to the Royal Botanic Garden, Edinburgh, during the Years 1889-1920.

On the 1st of April 1889, the control of the Royal Botanic Garden, Edinburgh, was vested in the Commissioners of His Majesty's Works, and the Garden became subject to the "Act for the Regulation of the Royal Parks and Gardens, 1872." From the date specified the Garden has been opened to the public on Sundays, and also for an extended period on Week-days. The table below shows the number of visitors to the Garden on Sundays and Week-days respectively during the thirty-two years which have elapsed since the Garden was transferred to the Commissioners of His Majesty's Works :—

Year.	Total in Year.	Total on Sundays.	Largest Number on a Sunday.	Smallest Number on a Sunday.	Total on Week Days.	Largest Number on a Week Day.	Smallest Number on a Week Day.
*1889 ...	368,219	187,457	13,935	129	180,762	3,834	50
1890 ...	446,540	216,345	11,262	91	230,195	4,032	65
1891 ...	454,083	220,543	9,445	340	233,540	3,228	76
1892 ...	437,205	218,233	13,581	149	218,972	2,666	43
1893 ...	531,232	271,893	12,860	45	259,339	3,197	40
1894 ...	526,948	268,793	13,515	68	258,155	3,153	28
1895 ...	516,608	264,497	15,227	127	252,111	5,292	26
1896 ...	516,407	296,576	13,517	527	219,831	3,825	30
1897 ...	475,210	271,730	16,001	74	203,480	3,153	20
1898 ...	443,289	258,499	12,840	123	184,790	3,234	39
1899 ...	461,686	259,424	15,161	105	202,262	2,758	30
1900 ...	561,359	324,856	17,700	268	236,503	3,667	53
1901 ...	586,461	339,229	19,256	258	247,232	4,627	45
1902 ...	522,363	295,892	15,561	165	226,471	5,461	60
1903 ...	606,184	355,310	19,583	135	250,874	4,202	41
1904 ...	639,066	367,290	20,719	374	271.776	3,564	42
1905 ...	584,546	330,995	19,859	100	253,551	2,708	60
1906 ...	699,558	394,030	21,959	84	305,528	3,760	44
1907 ...	674,208	422,899	25,601	708	251,309	3,365	40
1908 ...	585,171	342,106	20,549	570	243,065	2,898	39
1909 ...	683,243	394,861	24,334	165	288,382	3,483	71
1910 ...	777,864	430,776	21,813	244	347,088	3,598	80
1911 ...	708,943	420,163	22,765	82	288,780	3,828	66
1912 ...	714,170	383,476	25,930	88	330,694	3,515	81
1913 ...	876,585	500,205	27,398	680	376,380	4,100	59
1914 ...	776,280	414,518	25,521	106	361,762	5,337	62
1915 ...	730,761	442,179	21,155	125	288,582	3,827	55
1916 ...	695,364	367,713	20,227	98	327,651	3,926	41
1917 ...	737,070	428,752	21,531	170	308,318	3,293	59
1918 ...	727,782	320,450	20,811	236	407,332	3,911	39
1919 ...	811,937	436,055	21,775	231	375,882	6,274	52
1920 ...	644,856	399,398	19,340	481	245,458	3,777	84
Total for Thirty-two Years.	19,521 198	10.845,143	...	...	8,676,055	...	...

* Numbers in this year for nine months only.

INVERLEITH PLACE

INVERLEITH LANE

YARD ENTRANCE

HERBACEOUS BORDER

WEIGELA

YARD

QUERCUS

FAGUS

BERBERIS

ARBORETUM

QUERCUS

LONICERA

VIBURNUM

ULMUS

ILEX

HEATHS

COLLECTION OF HERBACEOUS PLANTS

RHODODENDRON

ROSES

POND

INVERLEITH ROW

ENTRANCES TO OFFICE
ALSO LIBRARY
LABORATORIES
AND LECTURE HALLS

WEST ENTRANCE

ARBORETUM ROAD

RHODODENDRON

OSMANTHUS

SYRINGA

LIGUSTRUM
BUDDLEIA

FRAXINUS

ELAEAGNUS

AESCULUS

ACER

RHAMNUS

ARBORETUM

CARPINUS

ALNUS

CONIFERAE

PHILADELPHUS

RIBES

PYRUS

SPIRAEA

CRATAEGUS

POPULUS

BETULA

SALIX

EAST ENTRANCE

ROCK GARDEN

INVERLEITH TERRACE

A Succulent Plants.
B Economic Plants.
C Central Greenhouse and Corridors.
D Insectivorous Plants.
E Orchids.
F Tropical Plants.
G Tropical Ferns.
H Tropical Plants.
I Heaths and Hardwoods.
J Aroids.
K Bromeliads.
L Pitcher Plants.
M Temperate Palms and Tree Ferns.
N Tropical Palms.
O Museum.
P Laboratories.
Q Large Lecture Hall.
R Library.
S Herbarium.
T Ladies' Cloak Rooms.
V Gentlemen's Lavatories.
X Point for view of City.
Y Business Office.
Z Regius Keeper's Office.
AA Rhododendrons.
BB Indoor Rockery.
CC Indoor Rockery.

KEY PLAN OF THE ROYAL BOTANIC GARDEN, EDINBURGH

JANUARY 1921

Area of Garden, 57·648 Acres.
Above Sea-level—Highest point, 109 feet; Lowest point, 48 feet.

LINKS 100 0 5 10 15 20
FEET 100 0 500 1000

ROYAL BOTANIC GARDEN, EDINBURGH.

WAR SERVICE ROLL.

1914–1919.

Showing the names, with short statement of service, of Members of the Staff of the Royal Botanic Garden, Edinburgh, who at the call of duty joined H.M. Naval and Military Forces for the Great War which began in August 1914.

AT the outbreak of war in August 1914 the appeal for recruits for H.M. Forces met with ready response from the Staff of the Royal Botanic Garden. Before many weeks had passed every fit man who would be accepted had left for service. At the time the Garden Staff was one of 110 members, of whom one-fifth were women. Of the men, 73 joined the Forces. Over a fourth of these have given their lives for their country. The publication of this list as an Official Record of the Garden will preserve for all time the story of the loyalty of our Garden Staff, and will carry, it is hoped, to the relatives and friends of those of the Staff who fell in the War the message that the devotion and self-sacrifice of these men is a living memory which we cherish and desire to perpetuate. And no less, we trust, will those who have borne their share of the burden and who are still with us accept this tribute of recognition of what they have done for us.

James Christopher Adam.

Joined staff of Garden as Helper, 12th April 1912. Enlisted Royal Scots, 17th January 1917. Rank—Private. Later, Machine Gun Corps. Service in field in Flanders, 3 months. **Killed in action, 21st March 1918.**

Robert Moyes Adam.

Joined staff of Garden as Helper, 1st July 1903. Assistant in Studio, August 1914. Enlisted Royal Garrison Artillery, 17th January 1917. Rank—Bombardier. Later, Royal Air Force—Lieutenant. Service in field in Flanders, 12 months. Demobilised, 3rd February 1919.

Thomas Adam.

Joined staff of Garden as Labourer, 31st July 1907. Mobilised 6th August 1914, 2nd Scots Guards. Rank—Private. Service in field in Flanders, 9 months. Killed in action, 16th May 1915.

Thomas Aird.

Joined staff of Garden as Labourer, 11th May 1914. Enlisted 11th Black Watch, 16th November 1914. Rank—Private. Service in field in France, 1 year. Once wounded. Killed in action.

Thomas Eneas Angus.

Joined staff of Garden as Probationer, 2nd December 1912. Enlisted 5th Battalion Cameron Highlanders, 29th August 1914. Rank—Private. Transferred 9th Division Cycle Corps—Sergeant. Later, Seaforth Highlanders—Captain. Service in field, 1 year 7 months. Wounded 13th November 1916. "Special Mention," Sir Douglas Haig's despatch of 31st May 1918.

George Ballantine.

Joined staff of Garden as Labourer, 13th May 1914. Enlisted 29th October 1914, Argyll and Sutherland Highlanders. Rank—Captain and Quartermaster. Service in the field in Flanders, 2 years 6 months. Two mentions in despatches. Demobilised, 18th August 1919.

William Frederick Bennett.

Joined staff of Garden as Probationer, 28th August 1911. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank—Private, later Lance-Corporal. Service in the field in Flanders, about 5 months. Missing, presumed killed in action, 25th September 1915.

George Blackmore.

Joined staff of Garden as Labourer, 2nd October 1913. Enlisted 7th Royal Scots Fusiliers, 1st September 1914. Rank —Sergeant. Service in field in Flanders, 4 months. Died of wounds, 7th March 1916.

George Brown.

Joined staff of Garden as Labourer, 21st July 1914. Enlisted 9th Royal Scots, 9th November 1915. Rank—Private. Service in field in Flanders, 2 years. Once wounded. Demobilised, 7th March 1919.

John Mathieson Brown.

Joined staff of Garden as Labourer, 8th August 1914. Enlisted 7th Royal Scots, 29th August 1914. Rank—Private. Service in field, Egypt and Gallipoli, about 1 year. Killed in action, Gallipoli, 24th November 1917.

Robertson Brown.

Joined staff of Garden as Labourer, 10th September 1913. Enlisted 2nd Royal Scots, 31st August 1914. Rank—Sergeant. Service in field in Flanders, 10 months. Once wounded, 11th March 1915.

Henry Howden Bryce.

Joined staff of Garden as Probationer, 13th January 1913. Enlisted 14th Royal Scots, 28th February 1916. Rank—Private. Service in field in Flanders, 12 months. Once wounded. Demobilised, 18th September 1919.

Andrew Ewing Calder.

Joined staff of Garden as Labourer, 27th June 1912. Enlisted Royal Field Artillery, 7th May 1915. Rank—Gunner. Service in field in Flanders, about 2 years. Died of wounds, 13th September 1918.

James John Campbell.

Joined staff of Garden as Gardener in training, 17th April 1905. Sub-foreman. Enlisted 5th Royal Scots, 31st August 1914. Transferred 11th Royal Scots. Rank—Private. Service in field in Flanders, 2 years 6 months. Demobilised, 22nd May 1919.

Duncan Coutts.

Joined staff of Garden as Probationer, 27th November 1912. Enlisted 29th August 1914, 5th Cameron Highlanders. Rank—Private. Service in field in Flanders, about 2 years. Died of wounds, 4th May 1917.

William Gordon Dickson.

Joined staff of Garden as Labourer, 3rd August 1914. Enlisted 5th Royal Scots, 4th September 1914. Rank—Private. Killed in action at Gallipoli, July 1915.

John Dykes.

Joined staff of Garden as Labourer, 22nd July 1914. Enlisted Royal Scots Fusiliers, 13th March 1915. Rank—Private. Demobilised, 7th February 1919.

William Dykes.

Joined staff of Garden as Boy, 3rd August 1914. Enlisted 5th Royal Scots, 31st August 1914. Rank—Private. Service in field in Gallipoli and France, 2 years. Once wounded. Demobilised, 7th January 1919.

Horace Ellwood.

Joined staff of Garden as Probationer, 2nd January 1913. Enlisted 5th Royal Scots, 13th September 1914. Rank—Private, later Corporal. Service in field in Gallipoli, 1 year 1 month. Twice wounded. Demobilised, 26th February 1919.

John Richard Ferisy.

Joined staff of Garden as Labourer, 8th December 1913. Enlisted 6th K.O.S.B., 28th August 1914. Rank—Sergeant. Service in field in Flanders and India, 4 years 2 months. Demobilised, 5th June 1919.

George Hugh Fothergill.

Joined staff of Garden as Probationer, 16th December 1912. Enlisted 5th Royal Scots, 18th October 1915. Rank—2nd Lieutenant. Service in field in Flanders, about 18 months.

Frederick Fraser.

Joined staff of Garden as Gardener, 14th October 1910. Enlisted 5th Royal Scots, 31st August 1914. Rank—Private, later Lance-Corporal. Service in field in Egypt, 6 months. Discharged, 20th August 1915.

John Fraser.

Joined staff of Garden as Labourer, 17th February 1913. Enlisted 19th August 1918, Royal Engineers. Rank—Pioneer. Discharged, 11th December 1918.

Robert Garner.

Joined staff of Garden as Labourer, 8th May 1914. Enlisted 2nd Royal Scots, 5th August 1914. Rank—Private. Later, 2nd A.M. Royal Air Force. Demobilised, 24th April 1919.

James Murray Grant.

Joined staff of Garden as Probationer, 2nd January 1912. Enlisted Cameron Highlanders, 29th August 1914. Later, Royal Highlanders and Labour Corps. Rank—Private, later Corporal. Service in field in Flanders, 3 years. Once wounded. Demobilised, 17th February 1919.

Daniel Greenshields.

Joined staff of Garden as Timekeeper, 1st May 1912. Mobilised 2nd August 1914, Royal Navy. Rank—Yeoman of Signals (Petty Officer). Service on Belgian Coast, in East Africa, and Home Waters, full period of War. Once wounded. Decorations, Distinguished Service Medal. Demobilised, 15th January 1919.

James Maxwell Hampson.

Joined staff of Garden as Labourer, 2nd April 1914. Enlisted 5th Royal Scots, 1st September 1914. Rank—Private, later Lance-Sergeant. Service in field, 1 year's service in Gallipoli, 2 years' service in France. Killed in action, 8th March 1918.

John Hatley.

Joined staff of Garden as Labourer, 23rd July 1914. Enlisted 15th November 1914. Rank—Private. Service in field in Flanders, 3 years. Killed in action, 18th April 1918.

John Henderson.

Joined staff of Garden as Labourer, 8th January 1915. Enlisted 6th K.O.S.B., 12th September 1916. Rank—Private. Service in field, 2 years 7 months. Demobilised, 5th November 1919.

John Hepburn.

Joined staff of Garden as Labourer, 27th April 1914. Enlisted 3rd Royal Scots, 1st September 1914. Rank—Company Sergeant-Major, a/R.S.M. Demobilised, 7th November 1919.

William John Hepburn.

Joined staff of Garden as Probationer, 24th March 1913. Enlisted 5th Royal Scots, 5th August 1914. Rank—Private, later Lieutenant. Service in field in Flanders, about 2½ years. Demobilised, 28th January 1919.

David Hume.

Joined staff of Garden as Labourer, 22nd April 1914. Mobilised 6th August 1914, 1st Royal Scots. Rank—Private. Killed in action in Flanders, 26th August 1914.

Douglas Hunter.

Joined staff of Garden as Park-keeper, 28th July 1912. Enlisted Gordon Highlanders, 29th August 1914. Rank—Company Sergeant-Major. Demobilised, 12th February 1919.

Henry Johnstone.

Joined staff of Garden as Labourer, 13th August 1914. Enlisted 5th Royal Scots, 3rd September 1914. Service in field in Egypt, Gallipoli, and Flanders, 3 years 9 months. Once wounded. Demobilised, 29th January 1919.

James Todd Johnstone.

Joined staff of Garden as Assistant in Library, 20th March 1912. Enlisted 7th Royal Scots, 2nd September 1914. Rank—Private, later Sergeant. Later, in Royal Defence Corps and Royal Scots Fusiliers. Demobilised, 23rd February 1919.

Arthur Henry Jones.

Joined staff of Garden as Labourer, 8th December 1911. Enlisted Royal Army Medical Corps, 5th August 1914. Rank —Private, later Corporal. Service in field, Ward Orderly in No. 11 General Hospital, B.E.F., France. Died in hospital, 19th May 1916.

Robert Keir.

Joined staff of Garden as Probationer, 5th August 1913. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank— Private, later Lance-Corporal. Service in field in Flanders and France, 3 years. Thrice wounded. Demobilised, 15th March 1919.

Charles Lamont.

Joined staff of Garden as Probationer, 20th August 1914. Enlisted 5th Royal Scots, 31st August 1914. Rank—Private, later Corporal. Service in field in Egypt, Gallipoli, and France, 3 years 10 months. Once wounded. Demobilised, 31st January 1919.

John McMillan Lugton.

Joined staff of Garden as Park-keeper, 13th January 1913. Enlisted Scottish Horse, 17th August 1914. Rank—Squadron Sergeant-Major. Service in field in Gallipoli, Egypt, Balkans, and France, 3 years. Twice wounded. Demobilised, 2nd February 1919.

Henry McBeath.

Joined staff of Garden as Stoker, 17th March 1909. Enlisted Scottish Horse, 4th September 1914. Rank—Sergeant. Service in field in Flanders, about 3 years. Died in hospital, 15th October 1918.

Alexander McCutcheon.

Joined staff of Garden as Gardener, 25th February 1907. Foreman, 21st July 1919. Enlisted Royal Scots, 31st August 1914. Rank—Sergeant. Service in field in Gallipoli and Flanders, 3 years 10 months. Demobilised, 27th January 1919.

William M^cNab.

Joined staff of Garden as Labourer, 26th May 1904. Enlisted Scottish Horse, 27th August 1914. Rank — Private. Demobilised, 16th October 1918.

Alan Menzies.

Joined staff of Garden as Probationer, 5th August 1913. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank —Private. Service in field in Flanders, 4 months. Killed in action, 25th September 1915.

George Joseph Milne.

Joined staff of Garden as Labourer, 24th April 1914. Mobilised 5th August 1914, Highland Light Infantry. Rank —Lance-Corporal. Service in field in Flanders, 3 years 5 months. Wounded. Demobilised, 17th November 1919.

Walter Henry Morland.

Joined staff of Garden as Gardener, 5th January 1910. Enlisted 5th Royal Scots, 2nd September 1914. Rank—Private. Service in field in Gallipoli, 3 months. Killed in action, 7th May 1915.

Alfred John Munday.

Joined staff of Garden as Gardener, 2nd January 1911. Enlisted 5th Royal Scots, 31st August 1914. Rank—Private. Service in field in Egypt and Flanders, 4 years 2 months. Demobilised, 14th May 1919.

James Murdison.

Joined staff of Garden as Labourer, 8th August 1914. Enlisted Army Service Corps, 29th September 1914. Rank— Private. Service in field in Flanders, 1 year. Demobilised, 17th May 1919.

William North.

Joined staff of Garden as Hall Attendant, 23rd June 1911. Enlisted 11th Royal Scots, 28th August 1914. Rank—Regimental Sergeant-Major. Service in field in France, 6 months. Invalided home.

David Ramsay Oliver.

Joined staff of Garden as Implement Keeper, 6th February 1911. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank—Private. Later, Lieutenant 3rd Gloucestershire Regiment. Service in field in Flanders and France, 3 years. Twice wounded. Demobilised, 17th July 1919.

Matthew Young Orr.

Joined staff of Garden as Assistant in Laboratory, 4th August 1913. Enlisted 7th Royal Scots, 29th August 1914. Rank—Captain. Mentioned in despatches. Gazetted 13th August 1918. Demobilised, 17th April 1919.

John Preston.

Joined staff of Garden as Park-keeper, 1st December 1908. Enlisted Seaforth Highlanders, 11th September 1914. Rank—Company Quartermaster Sergeant. Demobilised, 13th March 1919.

James Reid.

Joined staff of Garden as Probationer, 4th August 1913. Enlisted 5th Cameron Highlanders, 2nd September 1914. Rank—Private. Service in field in Flanders and France, 3 years 8 months. Demobilised, 26th January 1919.

John Reilly.

Joined staff of Garden as Labourer, 8th July 1914. Enlisted Royal Scots, August 1914. Discharged, 1915. Re-enlisted 1917. Rank—Private. Demobilised, April 1919.

Philip Reilly.

Joined staff of Garden as Labourer, 23rd January 1902. Enlisted 7th Royal Scots, 29th August 1914. Rank—Private. Demobilised, 23rd March 1919.

John Scotland.

Joined staff of Garden as Labourer, 23rd January 1907. Enlisted 6th Cameron Highlanders, 2nd August 1915. Rank—Private. Service in field in Flanders, 3 years. Once wounded. Demobilised, 16th March 1919.

James Scott.

Joined staff of Garden as Labourer, 24th July 1907. Enlisted Royal Marines, 1st June 1915. Rank—Private. Demobilised, April 1919.

John Severn.

Joined staff of Garden as Labourer, 8th April 1909. Mobilised 1st Gordon Highlanders, 5th August 1914. Rank—Lance-Corporal. Service in field in Flanders, 4 months. Once wounded. Discharged, 6th May 1916.

Edwin Lowther Sills.

Joined staff of Garden as Labourer, 2nd June 1913. Enlisted Gordon Highlanders, 25th August 1914. Rank—Lance-Corporal. Service in field in Flanders, 2 years 9 months. Demobilised, 24th April 1919.

Duncan Smith.

Joined staff of Garden as Gardener, 4th January 1909. Enlisted 5th Royal Scots, 4th September 1914. Rank—Private. Service in field in Gallipoli, 3 months. Killed in action, 11th June 1915.

James Stewart.

Joined staff of Garden as Labourer, 10th March 1913. Enlisted Royal Scots Greys, 29th August 1914. Discharged on medical grounds, 28th November 1914. Rejoined Royal Garrison Artillery, 14th August 1917. Rank—Gunner. Service in field in Flanders, 18 months. Demobilised, 19th August 1919.

John Stewart.

Joined staff of Garden as Probationer, 4th August 1913. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank—Lance-Corporal. Service in field in Flanders, 4 months. Killed in action, 25th September 1915.

Laurence Baxter Stewart.

Joined staff of Garden as Propagator, 22nd January 1902. Enlisted 65th Division Cyclists, 7th June 1915. Rank—Quartermaster Sergeant. Demobilised, 24th January 1919.

Samuel Stewart.

Joined staff of Garden as Assistant Head Gardener, 11th May 1908. Enlisted 5th Cameron Highlanders, 28th March 1916. Rank—Private, later Lance-Corporal. Service in field in Flanders, 1 year. Killed in action, 18th September 1917.

George Hugh Stuart.

Joined staff of Garden as Implement Keeper, 20th April 1914. Enlisted 5th Cameron Highlanders, 29th August 1914. Rank—Private. Service in field in Flanders, 6 months. Killed in action, 25th September 1915.

Daniel Spence Sweeney.

Joined staff of Garden as Hall Attendant, 1st June 1911. Enlisted 9th Royal Scots, 16th September 1914. Rank—Divisional Bandmaster. Service in field in Flanders, 1 year. Mentioned in despatches. Demobilised, 22nd February 1919.

George Tait.

Joined staff of Garden as Park-keeper, 14th August 1911. Enlisted 1st Gordon Highlanders, 29th August 1914. Rank—Sergeant. Service in field in Flanders, 4 years 2 months. Demobilised, 28th February 1919.

George Thomson.

Joined staff of Garden as Labourer, 2nd December 1913. Enlisted 7th Royal Scots, 29th August 1914. Rank—Sergeant. Service in field in Flanders, 1 year 10 months. Twice wounded. Demobilised, 17th February 1919.

James Stewart Tod.

Joined staff of Garden as Packer, 3rd November 1902. Enlisted 9th Royal Scots, 29th August 1914. Rank—Lance-Corporal. Service in field in Flanders, 3 years 11 months. Once wounded. Demobilised, 22nd January 1919.

John White.

Joined staff of Garden as Probationer, 9th December 1912. Enlisted 9th Royal Scots, 6th December 1914. Rank—Private. Later, Machine Gun Corps. Service in field in France, 1 year 2 months. Demobilised, 15th February 1919.

James Henry White.

Joined staff of Garden as Labourer, 5th February 1912. Enlisted K.O.S.B., 29th August 1914. Rank—Quartermaster Sergeant. Demobilised, 8th April 1919.

Alexander Wilson.

Joined staff of Garden as Park-keeper, 18th February 1913. Enlisted 2/1st Scottish Horse, 17th August 1914. Rank—Squadron Sergeant-Major. Demobilised, 3rd July 1919.

John Forsyth Wilson.

Joined staff of Garden as Labourer, 5th December 1913. Enlisted Royal Field Artillery, 4th August 1914. Rank—Sergeant. Service in field in Flanders, 3 years 7 months. Twice wounded, once gassed. Mentioned in despatches. Discharged, 7th January 1919.

Thomas Young.

Joined staff of Garden as Patrol, 24th April 1914. Enlisted 1st Black Watch, 5th August 1914. Rank—Private. Service in field in Flanders, 4 years 6 months. Demobilised, 22nd February 1919.

This record is completed by the names following of members of the Staff who in fields other than Naval and Military devoted themselves to special service of the State during theWar :—

William Wright Smith.

Joined staff of Garden as Assistant Keeper, 20th November 1911. Officer in Charge of Labour in Scotland to the Timber Supply Department of the Board of Trade, 1916–1918.

Harry Frank Tagg.

Joined staff of Garden as Assistant in Museum, 22nd January 1894. Scientific Officer in the Timber Supply Department of the Board of Trade, 1917–1918.